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THE

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THE RAILWAY MAGAZINE]

CORNISH RIVIERA EXPRESS, GREAT WESTERN RAILWAY.

Drawn by 4-cylinder 4-6-0 locomotive No. 4074, "Caldicot Castle."

(From a photograph by F. E. Mackay.)

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ST. ENOCH STATION HOTEL.

Notable Railway Stations and their Traffic.

ST. ENOCH, GLASGOW, L.M.S.R.

By J. F. GAIRNS, M.I.Loco.E., M.Inst.T.

ST. ENOCH station, Glasgow, hitherto the headquarters of the Glasgow and South Western Railway, but now the second of the two great terminal stations in Glasgow owned by the London Midland and Scottish Railway, has already received attention on several occasions in the pages of the RAILWAY MAGAZINE. It was included as No. 18 in the early series of articles under the general heading of "Notable Railway Stations," published in the February, 1902, number. Prior to that, however, an article had been published in the January, 1899, issue, describing traffic working at St. Enoch station, though at that time only part of the present station was in use. In the August number of the same year, further reference was made to St. Enoch station in an "Illustrated Interview" with Mr. David Cooper, then, and until the end of 1922, the General Manager of the Glasgow and South Western Railway. Again, in the September, 1904, number a further article was included, in which the late Rev. J. T. Lawrence, M.A., dealt with the new part of St. Enoch station, thus covering ground which was necessarily only indicated in the 1902 article, while in the April, 1911, issue brief reference was made to the station in connection with a series of articles describing various activities of the Glasgow and South Western Railway.

Notwithstanding that St. Enoch station has thus received extended attention in the RAILWAY MAGAZINE at various periods, most of this was in comparatively early years, and the many changes which have since been made—principally in regard to traffic, the station itself being very little altered since the enlargement of 1904—afford full justification for consideration in a new article based upon post-grouping conditions. In this connection, the writer has to acknowledge the courteous co-operation of officers of the L.M.S.R., and particularly of Mr. R. Gilmour, Station Master, who, it is interesting to note, held that position when

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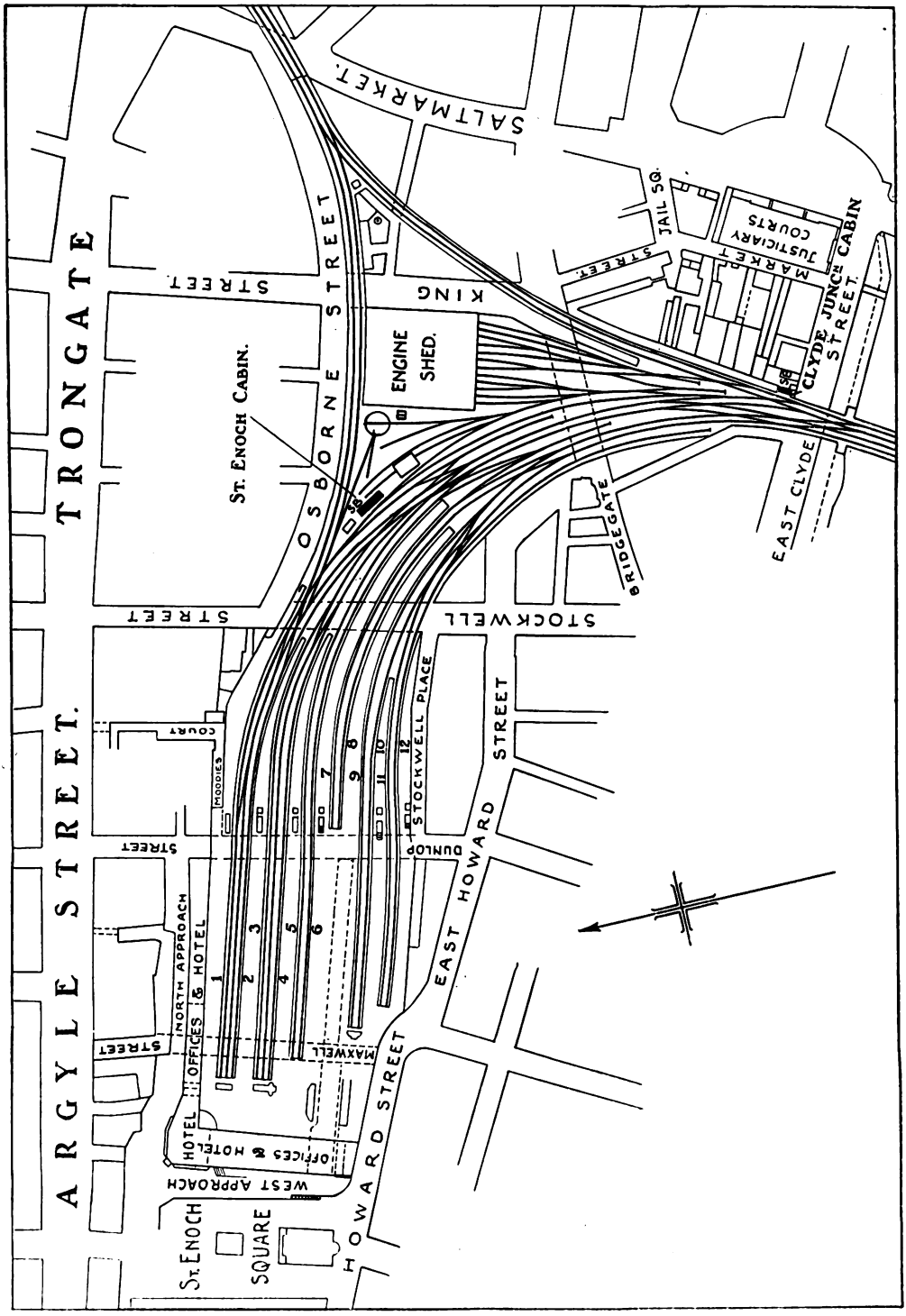

PLAN OF ST. ENOCH STATION AND ADJACENT LINES.

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Mr. Lawrence's article was published in 1904, though comparison of the portraits reproduced then and now reveal the fact that, while Mr. Gilmour is still hale and hearty, the passage of the years has left its inevitable mark upon him.

Until 1870 the Glasgow terminus of the Glasgow and South Western Railway was in Bridge Street, south of the Clyde, but in that year an extension, including a bridge over the river, was completed as far as Dunlop Street. Powers were then obtained to extend still farther to St. Enoch Square, and to erect a hotel there, and in 1876 the new station was formally opened on the occasion of the visit of the then Prince and Princess of Wales to Glasgow on October 17. The station was, however, only partially completed at that time. As explained in the 1902 article, when the station was opened, the offices on the north side had not even been commenced, while little more than the foundation stone of the hotel had been laid, and the principal entrance to the station was occupied by the platform employed in setting up the girders of the roof. As part of the celebrations, a covered platform, seating some 1,400 persons, was erected on the approach from St. Enoch Square, and a grand stand at the platform at which the Royal party were to alight. On the morning of the day in question their Royal Highnesses left Renfrew by a special train, which reached St. Enoch shortly before 11 o'clock. This special, which consisted of two Pullman cars, the "Albion" and the "India," respectively, was the "first passenger train" to use the station.

The original station, together with the hotel and offices, was actually completed in 1879, and at the time it was thought that good provision had been made for the future. There were then six platforms, the present Nos. 1–6, but numbered reversely, all covered by a single span roof 525 ft. long, 205 ft. wide, and 80 ft. above rail level at the highest point. Along No. 6 platform (the present No. 1) were most of the station offices, with general offices above, the higher floors being associated with the hotel. Beyond the roof pillars along the south side of the arched roof, was a carriage road, openings between the supports giving access to No. 1 platform (present No. 6), then used, as it is largely to-day, for principal long-distance main line arrivals. Behind the buffer stops of all platforms, Nos. 1 and 2 not extending quite so far as Nos. 3–4 and 5–6 (old numbering), was a wide circulating area, communicating with the booking hall in the centre. The general scheme was, in fact, very similar to the lay-out at St. Pancras station in London, including the provision of a great 12-ft. clock over the circulating area in the centre of the span of the roof. There is, indeed, a strong similarity between the older part of St. Enoch station and St. Pancras, and this resemblance extends also to the design of the hotel and of the station buildings as a whole. In fact, it is generally understood that the design of St. Pancras station and hotel was, in a considerable degree, followed in the case of St. Enoch station and hotel. As there were six platforms only in the old part of the station the span of the roof is 40 ft. less than in the case of St. Pancras.

In one respect, however, St. Enoch has been essentially distinctive as compared with St. Pancras, and that is in regard to its famous train indicator. When first erected, it extended only over the entrance to Nos. 3 and 4 platforms, as it required only six main sections, that being the number of platforms then in use. It has since been extended further in each direction, so as to include sections giving indications for all 12 platforms, together with notifications of train arrivals and special announcements. In style, however, it is unaltered, and with its midway multi-faced clock constitutes one of the most distinctive (and most consulted) features of the present-day St. Enoch station.

By lines curving away to the south, all platforms in the old station gave access to two lines over the original Clyde bridge. Nos. 5 and 6 (now Nos. 1 and 2), together with the middle line between, also communicated with a two-line curve to join the Saltmarket branch, by which access was had to the Glasgow and South Western goods depot at College, and the North British Railway. For several years, in fact, regular services of passenger trains were operated between St. Enoch and Springburn and between St. Enoch and Bridgeton Cross (N.B.R.), these trains necessarily using platforms Nos. 5 and 6

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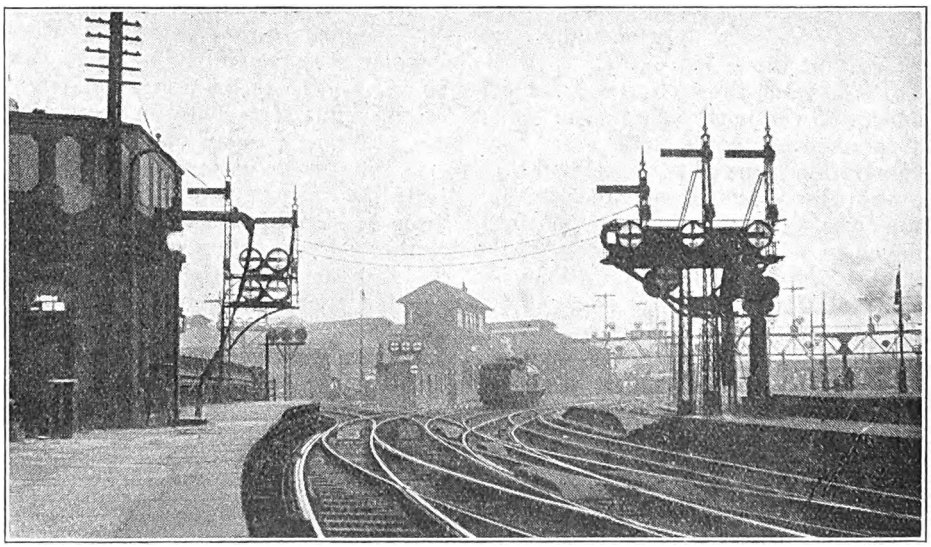
(now Nos. 1 and 2). There is also a direct route from the Clyde bridge to the Saltmarket branch, and this is still used for goods traffic to and from College and the L.N.E.R., and for facilitating station working, as will be described. In the triangle between the three routes thus constituted are located the St. Enoch engine sheds, coaling stage, turntable and engine sidings.

Increasing traffic demands rendered it necessary for the Glasgow and South Western Railway to apply in 1898 for powers to enlarge the station and to erect a new four-track bridge over the river in place of the original one, as well as for certain widenings beyond. The additional platforms, Nos. 7–12, together with the various new lines, were brought into use in 1904, so that, with its 12 platforms and its splendid hotel, St. Enoch is fully entitled to rank as one of the largest as well as one of the most notable stations in Great Britain.

Owing to the fact that the carriage road outside the original No. 1 platform (now No. 6) had to be retained, four only of the additional platforms are below the arched roof provided for the extension, and this is correspondingly smaller, its span being only 198 ft. and maximum height 40 ft. No. 1 (which became No. 6) was extended outwardly to its present length of 1,128 ft. and Nos. 7 and 8 were formed wholly outside the added span, in line with the carriage road. No. 9 is rather shorter than No. 6, in that the tracks do not extend quite so far. As Nos. 10, 11 and 12 terminate correspondingly, their outer portions, together with Nos. 7 and 8 and the extension of No. 6, are protected by verandah roofs.

Outside the station all the new platforms communicate only with the lines over the present Clyde bridge (four tracks), so that Nos. 1 and 2 are the only platform lines which have direct access to the Saltmarket branch. At this stage it may be mentioned that the lengths of the respective platforms are now as follows: No. 1, 818 ft.; No. 2, 858 ft.; No. 3, 852 ft.; No. 4, 852 ft.; No. 5, 798 ft.; No. 6, 1,128 ft.; No. 7, 643 ft.; No. 8, 613 ft.; No. 9, 994 ft.; No. 10, 664 ft.; No. 11, 623 ft.; and No. 12, 718 ft.



GENERAL VIEW FROM No. 1 PLATFORM.

The principal approach to St. Enoch station is from St. Enoch Square, just off Argyle Street, one of Glasgow's main thoroughfares, and a few minutes' walk only from the Central station. In the Square itself a distinctive feature is the St. Enoch station of the Glasgow Cable Subway. If schemes announced by the Glasgow Corporation, which has recently

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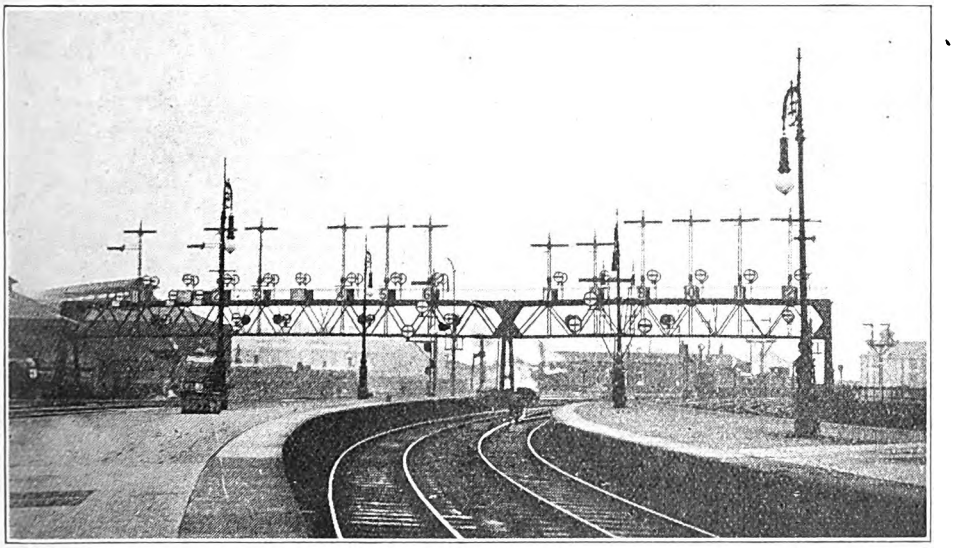
acquired the subway, come to fruition, these buildings will be removed and access given to the subway station from beneath the courtyard of the L.M.S. station, this courtyard, at approximately the level of the platforms in the main line station, being about 20 ft. above the Square. The courtyard is protected by a parapet wall, from which a good view is had over the Square. Outside the main booking hall the courtyard is covered, while, farther along, it gives access to the carriage road between platforms Nos. 6 and 9.

As one approaches the station the massive buildings of the St. Enoch Station Hotel necessarily attract most attention. At one corner is a portico leading to the main entrance to the hotel, though there is also direct access from the station platforms. The hotel has some 200 bedrooms, together with about 30 private sitting rooms and the usual public sections. In architecture, the building is somewhat ornate, and extends to five storeys above station level, maximum height from the level of St. Enoch Square being 130 ft. and from platform level 110 ft.

Just beyond the outer ends of the two roof spans the railway crosses Dunlop Street, and at this point a low-level booking office is provided on the north side, connecting with a subway having stairways leading to each of the platforms. This booking office is at present closed at 6.30 p.m., as its main purpose is served as soon as the evening rush has come to an end. Alongside this subway is, however, another one, communicating by hydraulic hoists with each platform or group of platforms, and utilised for parcels and other work, which is thus kept clear of passenger movements in the station above. At the north end this subway connects with the parcels offices on street level adjoining Dunlop Street, so that all parcels traffic can be brought to or removed from the station through adjacent side streets and without interfering with the work of the station at the St. Enoch Square frontage.



GENERAL VIEW FROM No. 7 PLATFORM.

Most of the station offices are arranged in connection with the circulating area behind the buffer stops of the various platforms and along No. 1 platform. In the corner is a direct entrance from the station to the hotel, and extending along No. 1 platform the following public offices may be noted:—Between the hotel entrance and a passage leading down to Maxwell Street is a large third-class refreshment room, with fruit and confectionery stalls outside, and next to it one of the entrances to the range of general offices above. Beyond the passage may

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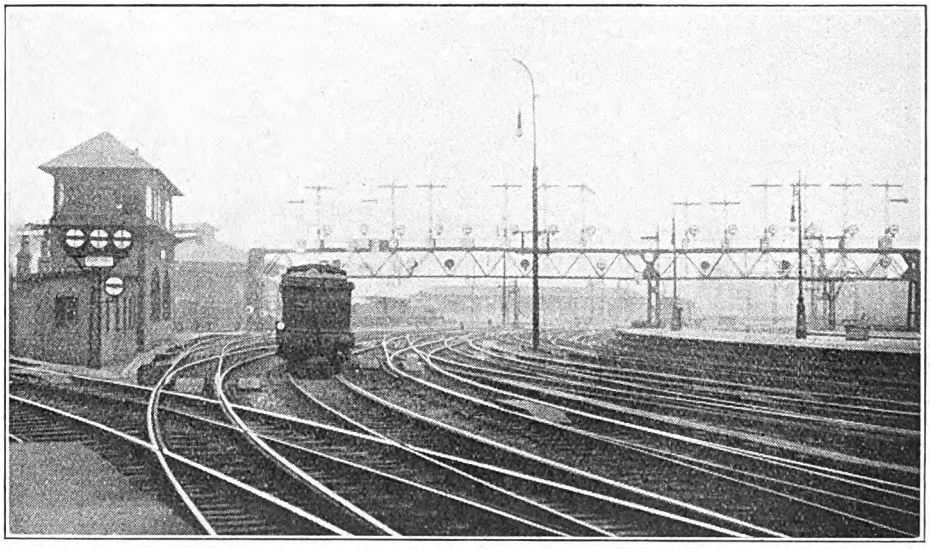
be noted a first-class refreshment room, tea room, station master's and inquiry offices, together with ladies' and gentlemen's waiting rooms. There are also hairdressing saloons, including one for ladies. Beyond is a public season ticket office and a series of offices associated with the Traffic Department or allocated to staff purposes. Beyond the point where Dunlop Street is crossed are the upper floors of the Parcels Department, which are now used by the Traffic, Accounts and Telegraph Department. This building also accommodates a public telegraph office.

Returning to the circulating area, adjoining the hotel entrance in that direction, is a large waiting room and "popular tea room." Next to this is a passage leading direct to the courtyard, for the use of passengers not requiring to pass through the booking office. The booking hall is a large and lofty compartment, with five double doors leading to the courtyard, any or all of which can be brought into use as required. The booking windows, of which there are eight, are arranged at intervals along the walls of the booking office proper, which curves round from one wide doorway leading to the circulating area to another. Each booking section has over it a window, so that indications thereon are illuminated by means of the lights within the office. Further indications are shown on panels placed adjacent to the respective booking openings. Behind the booking office, and therefore centrally along the walls of the circulating area, is the Glasgow and South Western Railway War Memorial, bearing the names of 302 employees who gave their lives during the Great War. Beyond the booking hall is another passage leading direct to the courtyard, and next to this are left luggage and cloak rooms. At right angles to this range of buildings, and in line with the old boundary, is the shop parcels section, with a booking office for bicycles, perambulators, &c. As already mentioned, the cab road passes outside the old boundary wall, an archway being provided to give access to the courtyard. In line with platforms Nos. 9–12, part of the space is mainly used for handling milk traffic, in connection with which are several small offices. There is also an inclined way leading direct to St. Enoch Square and passing below the station courtyard, which at this point is some 20 ft. above.



VIEW OF SIGNAL CABIN AND BRIDGE OF SIGNALS.

One or two incidental features may be mentioned here in regard to the station. Thus, while the platforms beyond the station roofing in the older part of the station are entirely open, the platforms

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in the newer part are protected by verandah roofing over the outer portions. Another point worthy of comment is that many of the seats provided along the platforms bear the inscription "No Smoking Here." A special feature of St. Enoch station, however, is its signalling, in that it was one of the first British railway stations to be equipped with electrically-operated signals. Based upon experience already gained at Victoria (L.B. & S.C.R.) station in London, the desirability of providing signalling equipment which would cover practically every shunting movement required at a busy terminus caused the Sykes system to be adopted when St. Enoch station was entirely re-signalled in 1898.

Although the accommodation was doubled when the station was enlarged, it became possible, by the introduction of electric signalling, to continue control in one cabin only, and to provide signals in the "wholesale" fashion required to cover every possible traffic movement. Thus, while there were standard semaphore signals covering arrival and departure of trains, every other movement was covered by a shunting signal of the Sykes "banner" type, a relatively cheap design permitting of multiplication to the extent desired, so that, in its present condition, St. Enoch has the enormous number of 145 banner signals, in addition to 66 of the ordinary semaphore type. A number of the banner signals are of the double-acting type, that is, the banner arm falls to the left for movements in the right direction and falls to the right for movements on the facing road.

As at Victoria in London, it was not at the time considered necessary to arrange for the points also to be operated by power, so that St. Enoch station box, in addition to about 400 electrically-operated signal levers (in the form of slides or buttons placed above the point levers), with 26 route levers, has a range of 49 levers applying to the points.

This system of signalling is also in operation at Clyde junction box, which controls the junction to the Saltmarket line (leading to College goods station and the L.N.E.R.); at Saltmarket junction, which controls the points of the branch line leading to St. Enoch; at Gorbals junction, where the Kilmarnock *via* Barrhead and Paisley lines diverge on the south side of the Clyde; and at Port Eglinton junction, where the line to Paisley (Canal) and the old Glasgow and Paisley joint line diverge.

Although there are now no through trains regularly worked between St. Enoch and the Saltmarket branch, the fact that a triangle is available is very useful, in respect that all trains which start from Nos. 1 and 2 platforms, and the carriages of which come from the sidings, are run forward to Saltmarket junction (instead of direct to St. Enoch) and set back to No. 1 or No. 2 platform ready for the journey, while trains which arrive at No. 1 or No. 2 platform can be set back to Saltmarket junction and proceed thence *via* Clyde junction to the sidings at Bellahouston or elsewhere, as necessary. The triangle is also used for the turning of engines, which avoids the necessity of engines having to proceed to the turntable in the locomotive depot.

While there is very little inner suburban traffic now dealt with at St. Enoch for the reason that, on account of the development of the electric tramways, the greater volume of suburban traffic in the districts served by the Glasgow and South Western Railway was transferred from the trains to the cars, and the company adopted the definite policy of encouraging and developing long-distance residential traffic. A large proportion of the total traffic now operated is of a season ticket or contract character. This applies more particularly in regard to the older lines *via* Paisley. Thus, utilising either the original joint line *via* Paisley (Gilmour Street) of the G. & S.W. line *via* Paisley (Canal) to Elderslie junction, there is now, at times of business pressure, a constant succession of fast or semi-fast trains proceeding to Ayr (or beyond), Ardrossan, Largs, or Greenock, or Kilmarnock *via* Barrhead. Moreover, while fast trains are naturally most numerous at the hours of business travel, owing to the fact that relatively little attention requires to be paid to the possible needs of inner stations (the inner districts are well served by the Glasgow Corporation tramways), even in the slack hours there are frequent trains of a semi-fast character over all routes.

The late Glasgow, Barrhead, and Kilmarnock joint line (*see* RAILWAY MAGAZINE for January, 1923), besides carrying

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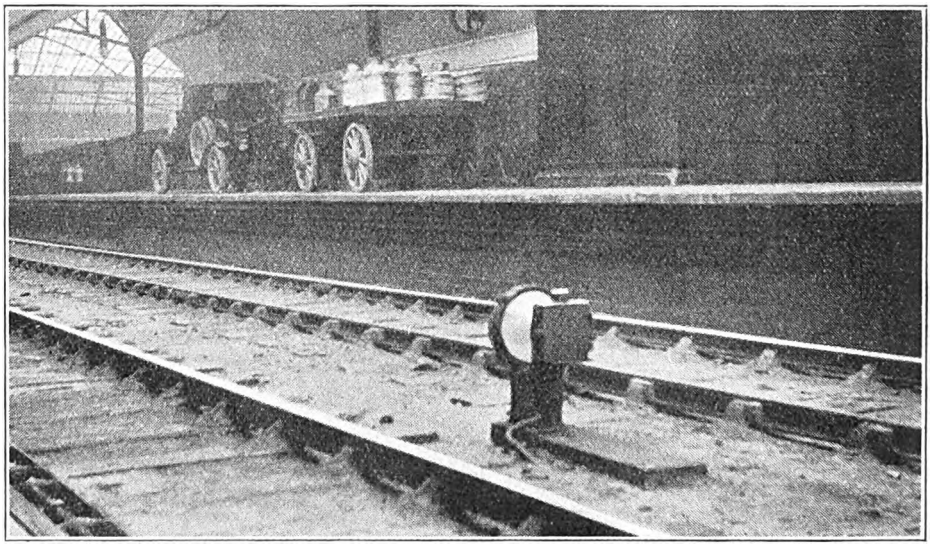
the principal through trains to and from England, supplies also a fair amount of important residential traffic, though in this case there is, for practical purposes, only the one route concerned. There are also local branches to Renfrew, over which a number of trains are worked at certain times, though mainly to meet the needs of workmen's traffic, no attempt being now made to provide frequent all-day facilities.

At one time there were quite a number of express trains between London (St. Pancras) and Glasgow (St. Enoch) *via* the Midland and Glasgow and South Western routes. Now, however, the number has been reduced somewhat, so that the principal trains of this class are the 9.15 and 11.55 a.m. and 9.10 p.m. from Glasgow (St. Enoch), and the 9.50 and 11.45 a.m. and 9.30 p.m. from London (St. Pancras). There are, in addition, the 5.30 p.m. from Glasgow and the 1 p.m. from Carlisle (due at St. Enoch at 3.46 p.m.), providing Anglo-Scottish facilities, though chiefly to places other than London. Of these trains the 9.15 and 11.55 a.m. from St. Enoch include restaurant cars which work through between Glasgow and London, while the former also conveys through coaches from Glasgow to Nottingham and Bristol. The 5.30 p.m. from St. Enoch, which includes one of the very fine G. & S.W. restaurant cars as far as Carlisle, has sections for Leeds and Bristol. In the down direction the 9.30 p.m. from St. Pancras includes, in addition to sleeping cars from London, a through carriage from Bristol to Glasgow. The 1 p.m. from Carlisle includes one of the G. & S.W. restaurant cars for the supply of teas, the 9.50 a.m. from St. Pancras is a restaurant car express from London and attaches a through carriage from Nottingham to Glasgow, while the 11.45 a.m. from St. Pancras is a similar train, except that it includes through carriages from Bristol to Glasgow. Although these trains are now fewer than they were at one time, most of them carry a considerable volume of traffic, and it is usually necessary to double-head them between Glasgow and Kilmarnock (the big 4-6-4 tank engines sometimes take these trains single-handed) in view of the heavy tonnage and very severe gradients to be negotiated, if not also between Kilmarnock or Dumfries and New Cumnock.



MILK TRAFFIC IN NEW PART OF STATION.

It is, however, on the routes *via* Paisley that the heaviest traffic is conducted, involving at times a very close succession of trains. Moreover, by making use of the alternative routes available, not only between Glasgow and Elderslie, but also

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between Elderslie Junction and Dalry Junction, it is frequently practicable to schedule trains even for the same direction, and apparently in conflict with one another, very closely together, the faster passing the slower as required by means of one or other of these alternatives. This applies also to trains on the Greenock route, so that a study of trains to and from St. Enoch directs attention to many interesting features of train working which can only be understood when regard is paid to the manner in which these alternatives are utilised. Moreover, during the hours of business travel, a very large proportion of these trains are fast, and the traffic on each route is sufficient to call for them in considerable numbers. At busy periods, therefore, there is an almost constant succession of trains arriving at or departing from one or other of the 12 platforms at St. Enoch. As an example, the following is a list of trains arriving at St. Enoch for the morning traffic between 8 and 10 a.m. during the summer months.

Due.	Platform No.	From—
8.00	10	Kilmarnock (*via* Dalry).
8.01	7	Renfrew.
8.02 MO	11	Girvan.
8.02 SO	6	Carlisle (from London).
8.10 M	9	Fairlie Pier (fish).
8.12	5	Barrhead.
8.14	8	Renfrew.
8.21	7	Ayr.
8.26	10	Renfrew.
8.31	9	Ardrossan.
8.31 MO	5	Paisley (West).
8.34	3	Kilmarnock.
8.35 MO	4	Largs.
8.36 M	5	Paisley (West).
8.37 SO	6	Carlisle (from London).
8.37	10	Greenock.
8.40 MO	6	Largs.
8.43	4	Beith.
8.46	5	Largs.
8.46	10	Kilmarnock (*via* Dalry).
8.48	3	Darvel.
8.48 M	9	Largs.
8.50 MO	9	Troon.
8.50	8	Corkerhill.
8.54	4	Greenock.
8.55	10	Ayr.
8.57 MO	7	Fairlie Pier.
8.59	3	Barrhead.
9.03	11	Greenock.
9.05	3	Ayr.
9.10	10	Fairlie Pier.
9.11	3	Ardrossan (Winton Pier).
9.10 MO	12	Ayr.

MO = Mondays only.
M = Mondays excepted.
SO = Saturdays only.

Due.	Platform No.	From—
9.15	9	Girvan.
9.18	3	Kilmacolm.
9.27	10	Dalry.
9.31	8	Greenock.
9.35	4	Largs.
9.45	5	Johnstone.
9.46	3	Dumfries.
9.48	2	Ayr.
9.51	7	Greenock.
9.56	2	Neilston.
9.58	6	Ardrossan (Winton Pier).

The Mondays Only trains indicated above are mostly extras put on in view of the heavy traffic in summer, particularly from the Ayrshire coast resorts, in connection with which there is a heavy week-end traffic, though some of the additional trains actually represent the division, on Mondays, of trains which on other days are combined. Many of the fast trains are also of the "No luggage conveyed" order, to prevent their being delayed, in view of the large number of residential passengers who travel into business with them and for whom punctuality is a first essential.

Similar particulars may be given in regard to departures. Thus, on an ordinary week-day, the following trains leave St. Enoch between 5 and 6 p.m.

Depart.	Platform No.	To—
5.00	1	Kilmarnock.
5.00	2	Greenock.
5.05	5	Beith.
5.05	10	Ayr.
5.08	5	Greenock.
5.10	1	Barrhead.
5.10	3	Stranraer.
5.12	6	Corkerhill.
5.15	11	Ayr.
5.18	8	Renfrew (Wharf).
5.20	2	Largs.
5.25	4	Largs.
5.27	7	Ardrossan.
5.30	1	Carlisle.
5.32	3	Kilmarnock (*via* Dalry).
5.35	2	Carlisle.
5.37	10	Paisley (West).
5.40	1	Barrhead.
5.45	9	Greenock.
5.55	1	Ayr.
6.00	3	Kilmarnock.

On Saturdays the problem is even more complicated, in that associated with the residential traffic expresses there is a heavy pressure, particularly during the summer months, on trains serving the various Clyde resorts and connecting with the Clyde steamers. The pressure commences virtually from

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midday, so that, although the list is necessarily a lengthy one, it will be best to cover the two hours from 12 noon until 2 p.m.

Depart.	Platform No.	To—
12.05	5	Greenock.
12.10	2	Ayr.
12.12	1	Dumfries.
12.20	4	Kilmarnock.
12.20	7	Ardrossan.
12.30	1	Stranraer.
12.35	2	Greenock.
12.43	1	Paisley (West).
12.45	1	Barrhead.
12.50	8	Largs.
1.00	6	Girvan.
1.03	9	Greenock.
1.03	1	Darvel.
1.05	5	Ayr.
1.08	3	Beith.
1.10	2	Largs.
1.11	10	Ayr.
1.12	5	Barrhead.
1.14	8	Ardrossan Pier.
1.15	4	Largs.
1.18	3	Kilmarnock (*via* Dalry).
1.20	7	Greenock.
1.22	1	Paisley (West).
1.25	11	Dumfries (Stock).
1.30	6	Renfrew (P'field).
1.35	2	Kilmarnock.
1.40	9	Greenock.
1.45	9	Greenock.
1.45	1	Fairlie Pier.
1.55	10	Ardrossan (Winton Pier).
1.58	8	Ayr.
2.00	7	Largs.
2.00	2	Carlisle.

As will be seen by reference to the time-tables, a large number of these trains are fast, many (particularly those running in connection with steamers) being non-stop from end to end, or calling only at one or other of the Paisley stations. Of special interest, too, are the express trains to and from Ayr and stations south thereof, including the Glasgow–Stranraer expresses and various trains designed to serve either or both of the routes between Ayr and Girvan. While there are several trains running non-stop between St. Enoch and Ayr, or calling only at one of the Paisley stations, there are many which call at Troon, Prestwick and other stations north of Ayr. Incidentally, while the Clyde steamers account for many fast trains to and from Greenock, Fairlie and Ardrossan, golf is a leading factor on the Ayr route. In fact, at times, this accounts for so much traffic that certain trains have become known as "golfers' trains."

Speaking generally, none of the trains

MR. J. GILMOUR,
Station Master,
St. Enoch, Glasgow, L.M.S.R.

on these routes calls for restaurant car or special accommodation, but nearly all are made up of modern bogie vehicles, some of corridor type. The 12.30 p.m. train from St. Enoch includes, however, a Pullman restaurant car to Ayr, which returns with the 2.1 p.m. train (11.35 a.m. from Stranraer) from Ayr to Glasgow. During the summer months a Pullman restaurant car is run to Turnberry and Girvan by the 5.10 p.m. train from St. Enoch, and from Girvan and Turnberry by the 7.25 a.m. train from Girvan (8.25 a.m. from Ayr). This car during the winter months is run between Glasgow and Ayr by the 5.15 p.m. train from St. Enoch and 8.27 a.m. train from Ayr. One of the Glasgow and South Western restaurant cars is run on Saturdays on the 12.10 p.m. from St. Enoch to Ayr, and returns on the 4.45 p.m. from Ayr.

This article would not be complete without mention of the tremendous traffic which is concentrated at St. Enoch immediately prior to and during the Glasgow Spring, Fair and Autumn holidays. On such occasions large numbers of relief trains have to be run and ordinary trains strengthened, and even then it is often

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as much as the officials can do to despatch trains quickly enough to prevent the station becoming congested, or to run sufficient trains to bring passengers back to St. Enoch on their return journeys. At month-ends, too, it is necessary during the summer period to run additional trains on all coast routes to provide for the traffic due to family parties proceeding to or returning from their temporary holiday homes.

At such times the ordinary totals of about 312 arriving and departing trains daily (exclusive of empty carriage trains) dealt with at St. Enoch become very considerably increased. Other special occurrences, such as the races at Ayr and other centres, provide their quota of special traffic. In common with most Scottish stations, St. Enoch is very quiet on Sundays, there being only eight arrivals and eight departures during the day. Two arrivals, one of milk from Carlisle, are due at 7.39 and 9.53 a.m., the remainder being entirely evening trains arriving between 7.35 and 9.16 p.m. There are departures at 10.10, 10.40 and 10.50 a.m., and at 2.30 p.m., while there are four trains between 7.15 and 9.10 p.m.

The staff under the station master includes 1 assistant station master, 6 station inspectors, 5 station foremen, 14 signalmen, 6 signal box lads and 168 other employees. Mr. R. Gilmour has now held the position of station master since 1902, and has thus completed 22 years in charge of this important station. He entered the service of the Glasgow and South Western Railway as a clerk at Cunninghamhead station, going to St. Enoch in the parcels office in 1878. In 1885 he was appointed relieving agent, and five years later became station master at Saltcoats. In 1901 he was made parcels agent at Glasgow, and in February, 1902, succeeded Mr. H. Smith as station master at St. Enoch.

AN ENGLISH LOCOMOTIVE IN SCOTLAND.

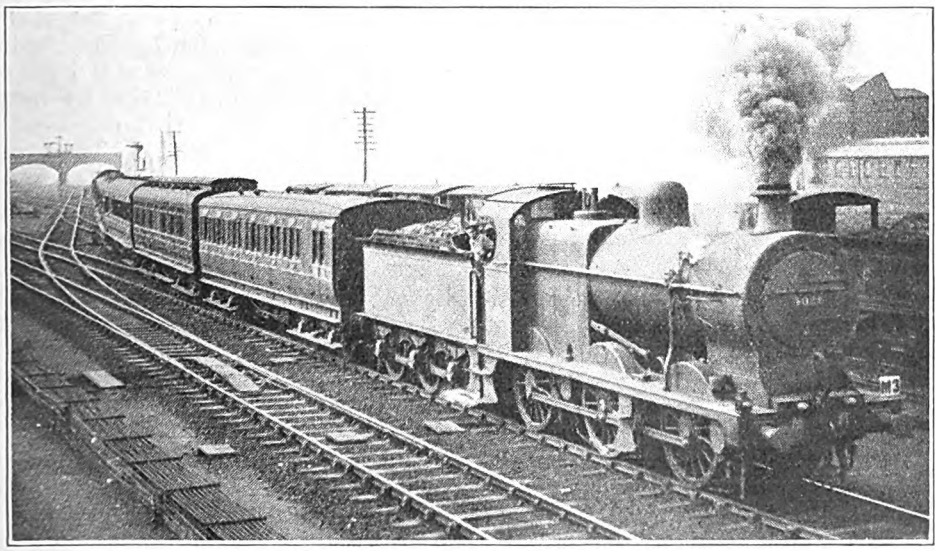

Photo.] [*Henry L. Salmon.*

MIDLAND 0-6-0 LOCOMOTIVE . No. 4026 WORKING PASSENGER TRAIN ON CALEDONIAN SECTION, L.M.S.R.

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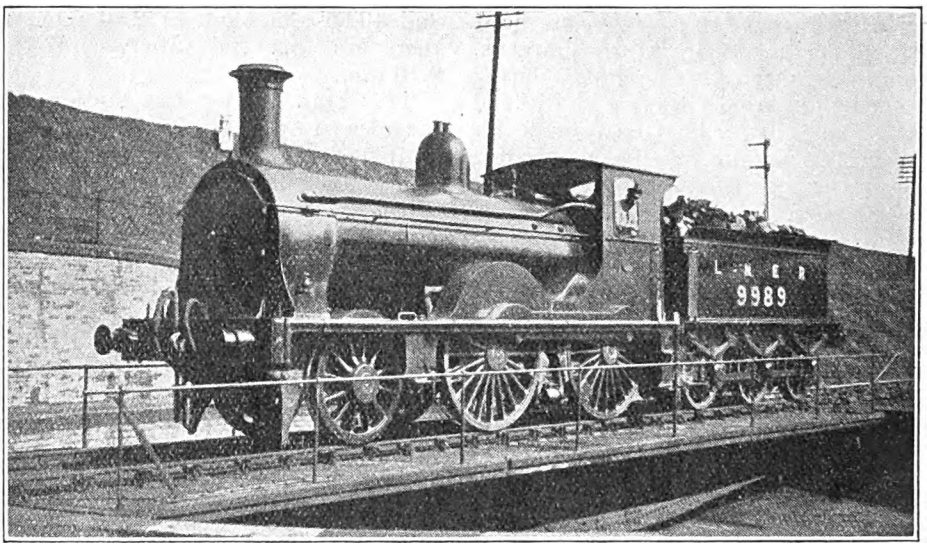
L.N.E.R. 2-4-0 LOCOMOTIVE No. 9989.



WE are indebted to Mr. R. D. Stephen, of Inverkeithing, for the photograph reproduced, showing one of the very few 2-4-0 locomotives still in service on the North British section of the L.N.E.R. The engine was originally built by Mr. Thomas Wheatley in 1873, and numbered 426. It was rebuilt for the second time by Mr. W. P. Reid in 1914. When placed on the duplicate list a few years ago it was numbered 1247. Last July it was re-numbered 9989 and painted in the new L.N.E.R. black livery. Since the photograph was taken, however, it has been again renumbered by having 9000 added to its N.B. duplicate number, and is therefore now No. 10247. Photographs of the class as originally built, and as rebuilt by Mr. Holmes in 1890, were published in Vol. XLVI of the RAILWAY MAGAZINE, pages 326-7. The following engines of this type are still in service: Nos. 1239, 10246 and 10247 at Dunfermline Upper, No. 10249 at Burntisland, and Nos. 1245 and 1256 at Tweedmouth. Cylinders are 17 in. by 24 in., and coupled wheels 6 ft. diam.

OWING to the need for including several special articles in this issue, further Scottish contributions will be published in the February number. It is also necessary to hold over the second part of Mr. Ahrons' article dealing with the Metropolitan and Metropolitan District Railways.

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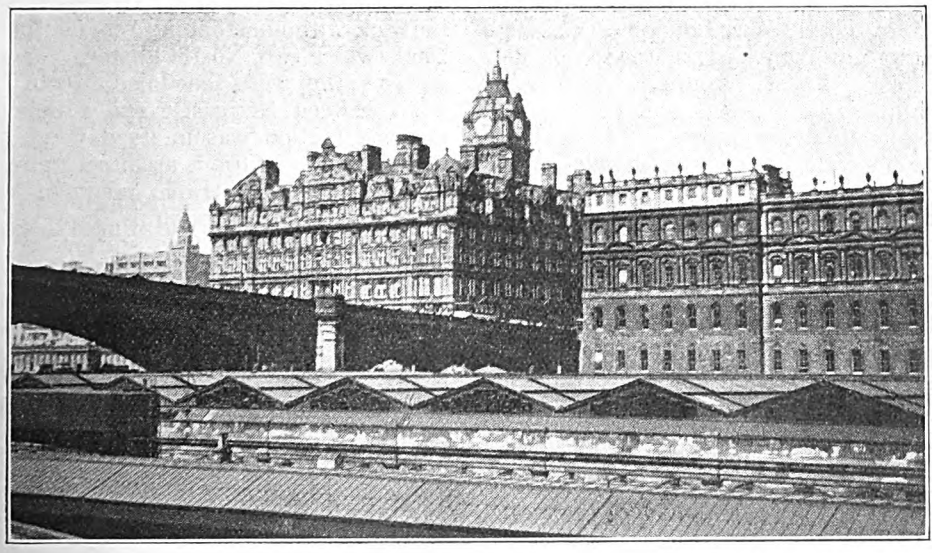

NORTH BRITISH STATION HOTEL, EDINBURGH.

View towards North Bridge, overlooking Waverley Station.

Scottish Coast Lines of the London & North Eastern Railway.

By "INDICATOR."

A REMARKABLE feature of the London and North Eastern Railway is the extent to which its great main line, forming the East Coast route to Scotland, justifies the use of the word "coast." Moreover, not only does a substantial proportion of the London-Aberdeen route closely follow the coast in the sense that it serves so many coast towns and villages, but for long distances the traveller is actually in sight of the sea, with frequent glimpses of coast scenery, which is in many places of an exceedingly interesting and attractive character. So far as the English portion of the route is concerned, there are usually other sections of the London and North Eastern system serving the coast itself, so that it is only north of Newcastle that the coastal element applies.

From Alnmouth to Berwick there are several places where the main line, if not giving a direct seaward view, as from Smeafield through Beal, Goswick, Scremerston and Tweedmouth Junction (along which stretch glimpses are had of Holy Island) is quite close to the coast. North of Berwick, however, a considerable part of the main line is very near to the sea, giving frequent glimpses of attractive rock and cliff scenery, while from Dalmeny to Dysart, along the Fifeshire coast, and from the Tay Bridge practically all the way until connection is made with the London Midland and Scottish Railway north of Montrose (at Kinnaber Junction), the sea is never far away, and for much of the distance is directly in view from the train. Even after connection is made with the London Midland and Scottish Railway the same characteristic is revealed, though London and North Eastern trains traverse the remaining 40 miles to Aberdeen by virtue of running powers only. The great point is, however, that for so many miles, to some extent in Northumberland, but more particularly in Scotland, both south and north of the

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Firth of Forth, the London and North Eastern Railway provides so largely an East "Coast" route in its truest sense.

While there is much of interest in regard to the Newcastle-Berwick main line, for the purpose of this article a commencement may be made at the famous Border station of Berwick-on-Tweed. For reference purposes readers may be referred to the map published on page 253 of the October, 1924, number,

Berwick station was described in the RAILWAY MAGAZINE for June, 1909, by Mr. Frederick Stoton. In that article it was pointed out that the then North British Railway was opened to Berwick on June 22, 1846. At that time the Royal Border Bridge had not been completed by the Newcastle and Berwick Railway, so that it was not until October 11, 1848, that through running became practicable, and then only by a temporary connection. On July 20, 1850, single line working was brought into operation, and on August 29 of the same year the bridge was formally opened by the late Queen Victoria and the Prince Consort. Incidentally, Mr. Stoton mentioned that the first instance of trains running through Berwick without stopping was on June 1, 1869, when two North Eastern running-power trains were scheduled to run non-stop between Newcastle and Edinburgh. Berwick station was in its day regarded as a notable station architecturally, as well as from the traffic point of view. An entire reconstruction is, however, in progress. Alongside the station are up and down through lines, used principally by goods trains, together with carriage sidings, engine shed and goods yards adjacent. Although the town of Berwick is in Northumberland, the county of the same name is in Scotland, the border being actually at a place known as Lamberton Toll, about 3 miles north of Berwick station.

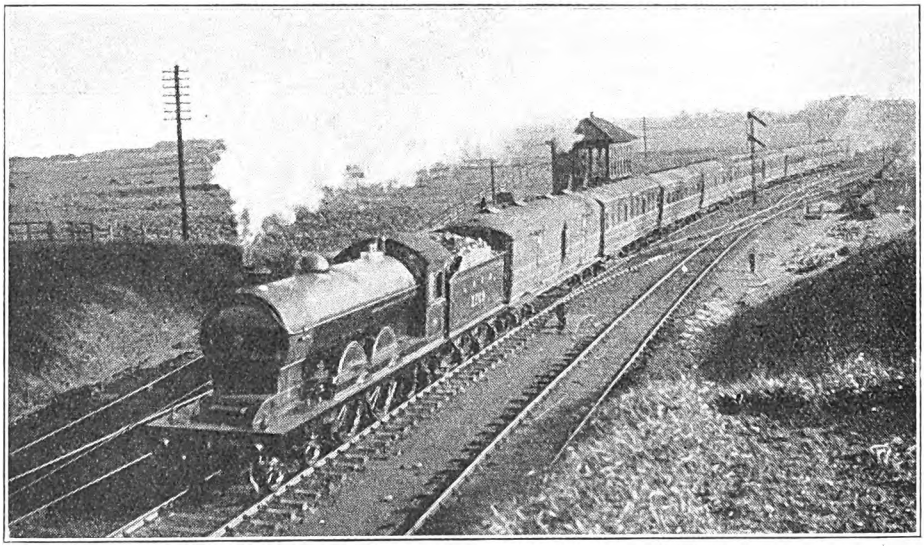

Photo.] [*C. J. L. Romanes.*

DOWN ANGLO-SCOTTISH EXPRESS LEAVING BERWICK.

North Eastern 4-4-2 locomotive No. 2209.

Shortly after leaving Berwick station, and from the point of view of the passenger from the south, the coast being entirely on the up side of the line, the railway traverses a series of cuttings, with frequent glimpses of the sea, as seen down rocky ravines, or overlooking the cliffs to the open sea. At Burnmouth, a passing view is had of the little village and harbour of that name, and, as the station is left, the branch line to Eyemouth descends on the up side of the main line

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until it diverges towards the coast, while the main line proceeds inland towards Reston Junction. On the way, Ayton is passed, and from Reston Junction, whence a branch line diverges to Duns and St. Boswells, a coach service is operated to and from St. Abb's Head. From Berwick to Burnmouth the down trains have to face a practically continuous up-grade of 1 in 190, and though the section to beyond Ayton is easier, the climb is continued almost unbroken through Reston to Grant's House. On this portion, although the coast has temporarily been left, there is much attractive scenery. Incidentally, on this section the railway crosses the Eye Water no fewer than seven times. At the summit of the grade Penmanshiel Tunnel is traversed, this being the highest point on the North British section of the London and North Eastern Railway main line.

A steep descent at 1 in 96, one of the great hindrances for up trains, leads down to Cockburnspath, where the coast is rejoined. Just beyond the station the railway passes from Berwickshire into Haddingtonshire, and thence through Innerwick to Dunbar the coast, if not actually in view, is never very far away. Inland, too, attractive views are had of the Lammermuir Hills. Along here the passenger is given glimpses of the ruins of Innerwick Castle, while an outstanding feature is Barness Lighthouse, which is seen from several points. After passing Innerwick, the quaint little fishing village of Broxmouth, about a mile and a quarter east of Dunbar, can be seen. Here and there, too, views are had of the famous Bass Rock, although it is best seen from North Berwick.

Dunbar is a place of sufficient importance to justify the stopping of several express and semi-fast trains. It is, indeed, a holiday resort held in considerable favour, although not much of its coast attraction can be seen from the train. It has a small harbour, while alongside are the ruins of Dunbar Castle. In common with practically every holiday resort in Scotland, Dunbar is well provided with golf and tennis facilities, together with a fine bowling green, while along the western cliffs a promenade has been laid out. On the beach there is a large swimming pond. Dunbar is further the southern terminus of the Edinburgh district local trains, and is given fast or semi-fast trains at the hours of business travel to provide for the

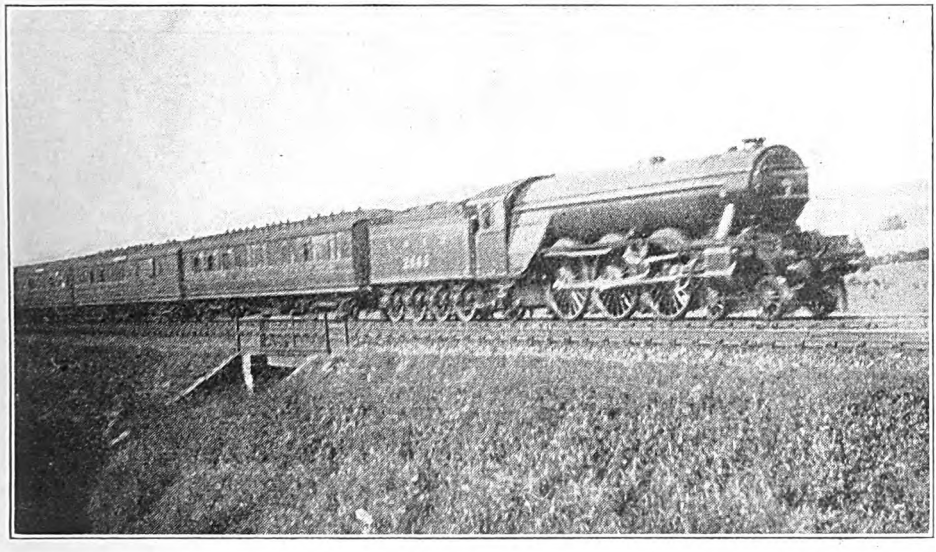

Photo.] [*C. J. L. Romanes.*

UP ANGLO-SCOTTISH EXPRESS NEAR RESTON JUNCTION.

L.N.E.R. 4-6-2 locomotive No. 2565.

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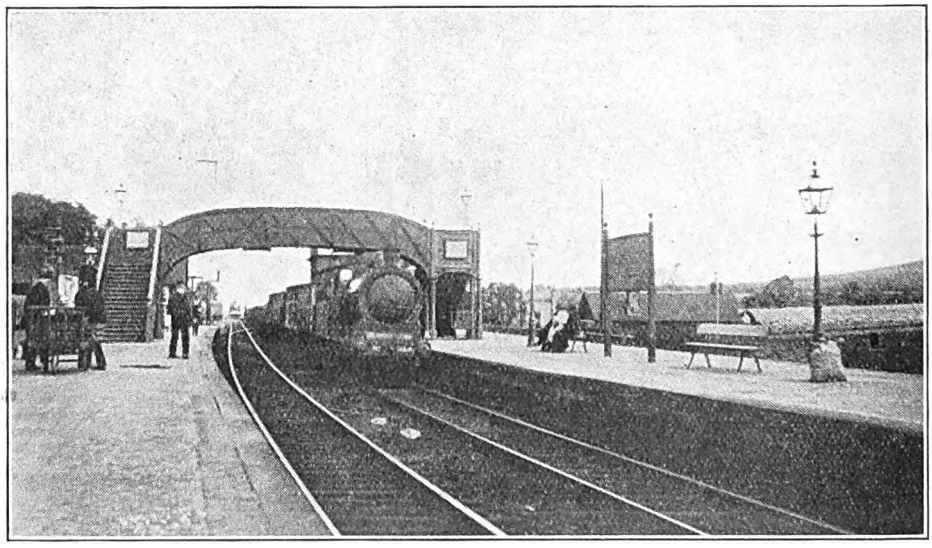
requirements of Edinburgh business people who reside there. Between Dunbar and East Linton occasional glimpses only of the sea are had, including, however, a fine view of Belhaven sands, and thence to Longniddry the main line itself runs inland. On this section, however, there are two important coastwise branches, from Drem to North Berwick, and from Aberlady Junction to Gullane.

These sections, together with the branch from Longniddry to Haddington, received attention in the RAILWAY MAGAZINE for July, 1912, when Mr. Tom Moffat dealt with the North British Railway in Haddingtonshire. As then explained, the North Berwick branch, 4 miles 60 chains in length, was opened on June 4, 1850, although the Gullane branch, 4 miles 65 chains in length, is quite a recent addition, having been opened on April 1, 1898. North Berwick branch trains make connection with the main line at Drem, but actually the single line runs alongside the main line for about half-a-mile before turning northwards. There is one intermediate station, Dirleton, near which are the ruins of Dirleton Castle, but practically all the way from Drem to North Berwick the outstanding feature is North Berwick Law, a picturesque hummock, some 200 ft. in height, standing quite alone but dominating the town from which it takes its name. The town of North Berwick is an interesting one, with many fine residences in the immediate vicinity, while there are splendid sands, and, by no means least important, two exceptionally fine golf courses, with no fewer than seven others within a radius of about five miles. The town courses are, to a great extent, laid out on the low cliffs which border the beautiful sands. Overlooking the sands, which in the season constitute a favourite place for family parties, and where all the usual facilities of a popular holiday resort are provided, there is, in the immediate foreground, the rocky island of Craigleith, and to the east is the Bass Rock, of which glimpses have been had while travelling along the main line. As befitting its importance, not only for holiday traffic, but also for regular business travel between Edinburgh and Glasgow, North Berwick has a very fine station, with two long platforms and a bay on the down side, the station buildings being neat and ornamental, as well as complete in equipment and modern in design.



LONGNIDDRY JUNCTION.

Longniddry is the junction station for both the Gullane and Haddington branches, though actually only the latter diverges at or immediately adjacent to the station.

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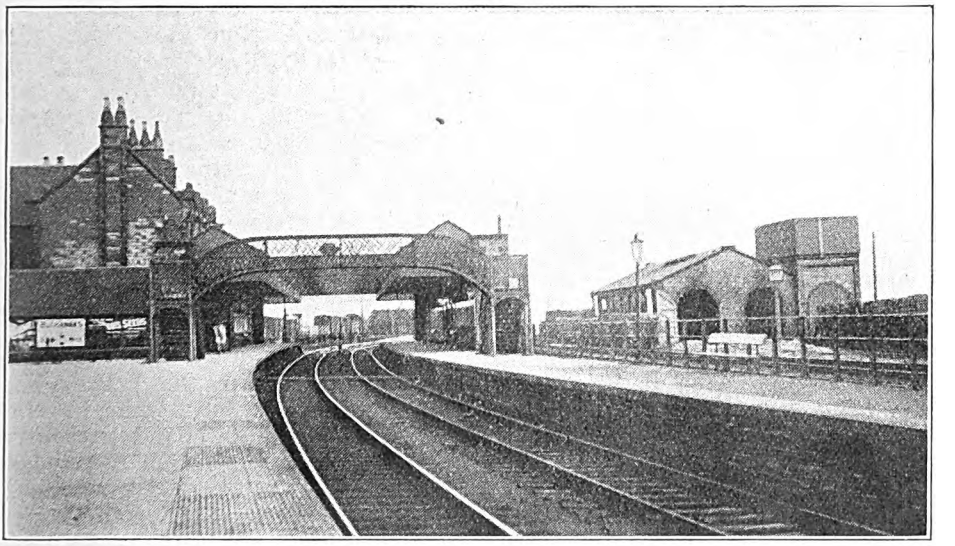
Even that is not an accurate description, in that the Haddington branch, although making connection with the main line at the station, runs alongside for some distance. Gullane trains, however, continue along the main line for a distance of one and a half miles, diverging at Aberlady Junction. Along the branch there is one intermediate station, Aberlady. Although it has to take a very distinctly second place compared with North Berwick, Gullane is rapidly becoming another favourite holiday resort along this stretch of coast, though much of its development is explained by reference to golf, for which it has become a great centre. The Gullane branch was originally promoted by the Aberlady, Gullane and North Berwick Railway Company, incorporated in 1893. The line was, as already mentioned, opened on April 1, 1898, and amalgamated with the North British Railway in 1900, but the portion between Gullane and North Berwick was never constructed. Aberlady station, although but an intermediate one, serves a place which is also growing in favour as a holiday resort, owing to its situation on Aberlady Bay and the golf links in the vicinity. As already indicated, Gullane is growing in residential favour among Edinburgh and Glasgow business people, for which reason the well-known Lothian Coast expresses include both North Berwick and Gullane portions, joined or separated at Longniddry.

For practically the entire distance from Longniddry to Portobello (in the immediate vicinity of Edinburgh), the main line follows the coast closely, though only to a limited extent does it give coastal views. At Prestonpans it is quite close to the shores of the Firth of Forth. From Prestonpans station there is an inland branch to Tranent, a steeply-graded line built to serve several collieries, in addition to one or two close to the main line near Prestonpans station. The Tranent branch was, it may be mentioned, opened as long ago as 1850, though for many years it has been used for goods and mineral traffic only.



DUNBAR STATION. MAIN LINES BEHIND DOWN PLATFORM.

After passing Inveresk station, just beyond which connection is made with several branch lines, scenic interest gives place to busy traffic surroundings. At New Hailes the Musselburgh branch diverges to serve the favourite holiday resort and residential town of that name, while the main line continues through Joppa and Portobello to the outskirts of Edinburgh itself. Both Joppa and Portobello are holiday places in great favour with Edinburgh residents. They are actually very close together (though

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each has its own station), and constitute practically one place, with a fine promenade and other features of a standard holiday resort.

About 60 trains each way call at Portobello, and there are frequent trains from the capital to Joppa and Musselburgh, including midday services used by season-ticket passengers travelling home to lunch.

Although in this area there are so many interconnecting lines, sidings, busy goods yards, &c., that industrialism supersedes the scenic element, it has still to be remembered that all along this section the railway maintains its characteristic of a coast line. Even in Edinburgh itself, while the main line proceeds inland, access to the coast is provided by the railway branches to Leith and Granton. It is not, however, until the Forth Bridge is approached that the East Coast line again becomes coastal. In crossing the Forth Bridge one has magnificent views both seaward and up the inland stretches of the Firth of Forth, while all the way from Queensferry, through Inverkeithing, Aberdour, Burntisland, Kinghorn and Kirkcaldy, to Dysart the railway gives frequent and interesting views of sand and rocky scenery. This stretch of line was, however, considered in detail in the April, 1923, issue of the RAILWAY MAGAZINE, so that there is no occasion to describe it, interesting though it is, in further detail.

From Dysart through Thornton Junction and Cupar to the southern end of the Tay Bridge, the main line passes more or less inland, though the sea is within sight at Leuchars Junction, but from Dundee northwards to Montrose the coast is never very far away, and frequently in full view from the train. From Dundee to Arbroath the line is actually joint with the London Midland and Scottish Railway, this section constituting the Dundee and Arbroath Joint Line, and passenger services are run by each of the companies concerned, the London and North Eastern from Dundee Tay Bridge station, and the London Midland and Scottish from Dundee East station. Once clear of Dundee docks and the busy industrial district adjacent thereto, the pleasant residential suburbs of West Ferry and Broughty Ferry are reached, the latter being not only a favourite place of residence for Dundee business people, but also a popular holiday resort. Adjacent to the station is the northern terminus of the ferry, which is still maintained across to Tayport, although the construction of the Tay Bridge has long since taken away its importance as a link in the main route from Edinburgh to Aberdeen.

Near Monifieth glimpses are had of the sands of that name, together with the High and Low lighthouses on Buddon Ness. At Barry Links there are artillery and rifle ranges, this being a favourite place for military training camps in the season, while Carnoustie is a popular holiday resort, famous also among golfers. For practically the whole distance from Monifieth to Carnoustie the line is edged on both sides by golf links, those on the seaward side being practically on the low cliffs which here fringe the coast. At Elliot Junction the Carmyllie Light Railway comes in on the down side, while out to sea the famous Bell or Inchcape Rock can be seen on a clear day. The Carmyllie Light Railway is worked jointly in connection with the Arbroath and Dundee Joint line. Arbroath is a busy manufacturing town, with, however, many attractions for tourists.

Beyond Arbroath the L.M.S. line to Forfar turns westward, while the L.N.E. main line continues inland until striking the coast again at Lunan Bay. Here a good view is had of the old red castle on the shore, as well as of Lunan Bay itself. Approaching Montrose the railway crosses the two channels of the South Esk River (by means of a long single line viaduct), with Rossie Island in the middle.

Montrose is another important town of considerable size and many industries. Just beyond the station a branch line diverges to serve the little watering place of Bervie, this branch closely following the coast. The main line, which is single-track as far as Hillside, but on which tablet exchanging apparatus is erected so that express trains do not need to reduce speed, continues inland, until at Kinnaber Junction—made famous during the 1895 "race to Aberdeen"—connection is made with the London Midland and Scottish Railway.

The remainder of the journey to Aberdeen is by virtue of running powers over

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the L.M.S.R., but, although the London and North Eastern has now become a "foreign" company, the coastal attributes have by no means come to an end. It is true that from Kinnaber Junction to Stonehaven the main line is inland, but from that place to Aberdeen the L.M.S.R. route takes over the coastal characteristics so pronounced on the L.N.E.R. farther south. Stonehaven itself is a favourite holiday resort, while the intermediate stations—Muchalls, Newtonhill, Portlethen and Cove Bay—serve other places in popular favour. The great point is, however, that along this stretch of line, constructed largely along the cliffs and quite near to the edge, continual views are had through ravines down to picturesque rock-bound coves, with here and there a little fishing village or a stretch of sand. Aberdeen, although generally regarded as a fishing port and industrial city, has also many of the attractions and characteristics of a favourite holiday resort, including fine sands and a promenade within a short tram ride of the centre of the city. It is, moreover, a great centre for tours in all directions, including a wide choice offered by the London and North Eastern Railway over the Great North of Scotland section, and in conjunction with the London Midland and Scottish Railway.

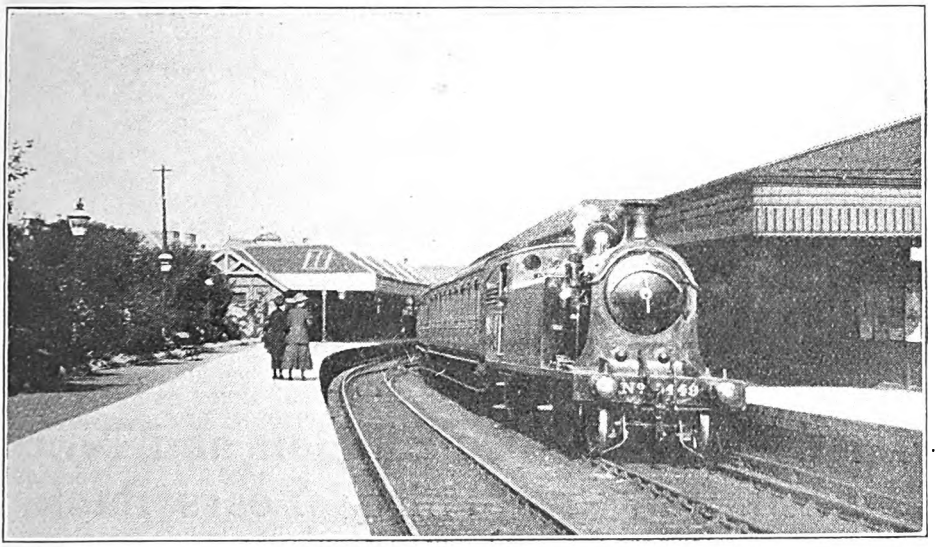
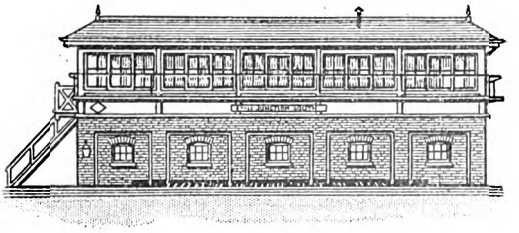


Photo.] NORTH BERWICK STATION. [*J. F. Gairns.*



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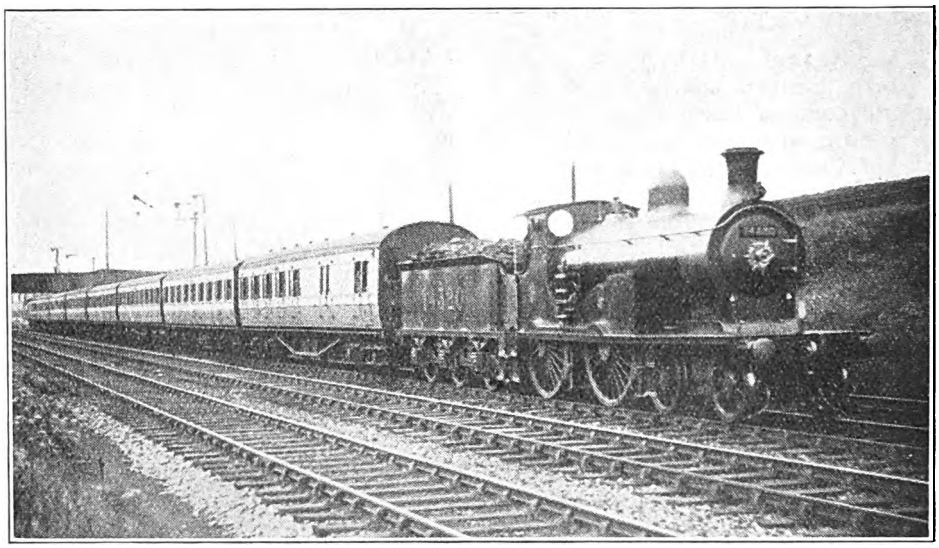

Photo.] [*Henry L. Salmon.*

GOUROCK-GLASGOW TRAIN NEAR IBROX.

Caledonian 4-4-0 Engine No. 14320.

Memories of the Caledonian and North British Railways Thirty Years Back.

By a CIVIL ENGINEER.

IN a well-known lawyer's office in Scotland there hangs a picture showing the tickets which were sold to the unfortunate passengers in the train which, with the Tay Bridge itself, was blown into the stormy Firth of Tay in that terrible Sunday night's gale at the close of 1879. The Tay Bridge, with the Forth Bridge, which was opened in 1890, formed the key to the Edinburgh and North service of the North British Railway.

There had long been a keen rivalry between this company and its great antagonist of that period, the Caledonian Company, and while the former had a direct route from Berwick to Edinburgh and Glasgow, it had no through route to Perth, Dundee and all that lay north thereof except either over the Caledonian line from Larbert to Perth and beyond, or by the Forth and Tay Ferries with the Fife lines between them.

The "kingdom" of Fife was virtually an island approached by ferry-boats from the South *via* Granton and Burntisland and from the North from Dundee to Newport or Broughty Ferry to Tayport. Both these passages, though of short duration, were across stormy waters and liable to interruption in heavy weather and in a heavy gale up or down the Firth (with the tide running against the wind especially) the crossing was often exceedingly rough.

The Caledonian Railway, after the Lancaster and Carlisle Railway had brought the L. & N.W.R. to Carlisle, had secured in course of time the best of the through English traffic to the North of Scotland, and had the quickest and shortest route from London to Glasgow and nearly as good a route to Edinburgh. The Midland Railway also had cut in for the Glasgow traffic to and from England, in conjunction with the Glasgow and S.W. Railway. But the North British Company had also a line from Carlisle to Edinburgh which ran in conjunction with the Midland Company. This competed not only

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with the West Coast Companies but with the East Coast Route, the North British Company's own original route to and from England. Of this Midland joint route the North British mileage was 98, as against 57 between Edinburgh and Berwick, while the majority of the large Midland manufacturing towns were served by the Midland Railway service to Scotland as well as by the East Coast partners, giving the N.B. Company, wherever its hands were free, an opportunity of routing traffic *via* Carlisle, and thus getting extra mileage.

As time went on it became more and more imperative to the N.B. Company to secure a better outlet to the North. The scare caused by the fall of the first Tay Bridge no doubt caused a delay in the project, but it became increasingly clear that this bridge had to be rebuilt and the question of bridging the Forth must also be undertaken.

The original design for the Tay Bridge was undoubtedly on the light side, and insufficient allowance was made for wind pressure on such a narrow, slender structure. This was especially noticeable in the cast-iron columns in the piers, which in more modern practice would have been probably much stronger than is absolutely necessary! The design was probably right, if human methods of executing it had been less faulty than they are.

The Forth Bridge was a more difficult problem to deal with owing to the depth of water and the necessity for allowing headway for very large vessels. By making use of the Island of Inchgarvie it was found possible to work in two main spans of 1,710 ft. in the clear and, in addition, the side spans were by no means inconsiderable, while the approach works were very heavy and involved the construction of entirely new lines of railway on either side. The writer was privileged to go over the whole works in December, 1886, when construction was well advanced; he had also the pleasure of knowing personally the two expert resident engineers who represented Messrs. Fowler & Baker, the firm of civil engineers responsible for the bridge. The first of these, Mr. P. W. Meik, M.Inst.C.E., was responsible for the deep-water foundations and heavy masonry and concrete work, and was afterwards the writer's chief for some years. Mr. Meik was succeeded by Mr. F. E. Cooper, M.Inst.C.E., who was responsible for the steel girder work resting upon Mr. Meik's portion of the work.

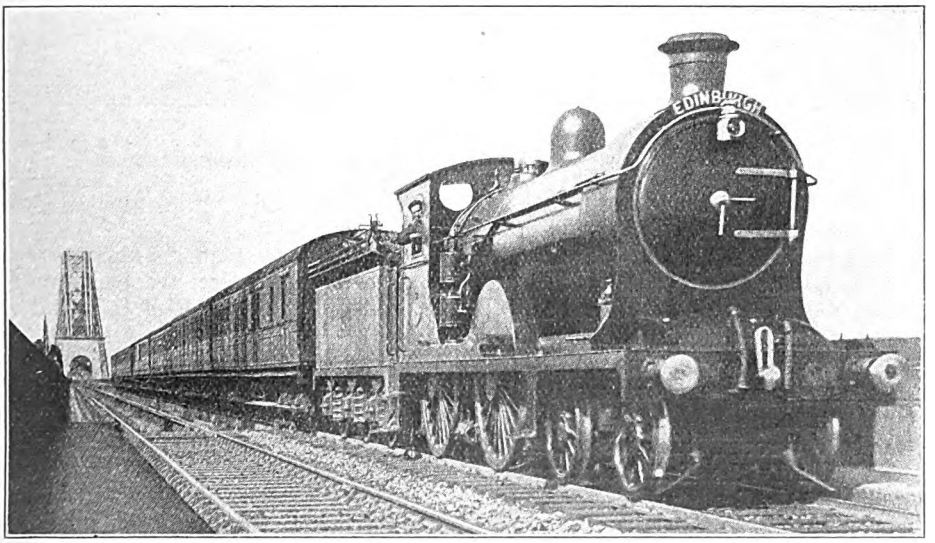

Photo.] NORTH BRITISH RAILWAY. [*Leslie J. Thompson.*

Perth–Edinburgh train leaving the Forth Bridge. 4-4-0 superheater locomotive No. 244, "Madge Wildfire."

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In the early 'nineties both the Tay and Forth Bridges were opened for traffic, and the North British Company thereby enabled to compete on level terms with its old adversary, the Caledonian.

In the meantime, during the construction of these great bridges, the "Race" in August, 1888, from London to Edinburgh between the great rival routes had taken place.

Previously to August, 1888, the principal day Scotch expresses from each end had occupied nine hours by the East Coast and ten by the West Coast, but the latter route conveyed third-class passengers, which the former did not.

concerned in the working in this "race" it merely provided the road from Berwick to Edinburgh over which the North-Eastern engines ran. The Caledonian engine, however, on one occasion ran the 100¾ miles from Carlisle, over Beattock summit, to Edinburgh in 103 min. After this contest both the East and West Coast services were fixed at 8½ hours for the day services between London and Edinburgh, the Midland Company contenting itself with a more moderate over-all journey speed, and no doubt benefiting by the carriage of such nervous passengers as thought it safer, in blissful ignorance of the fact that on the steeper grades of the

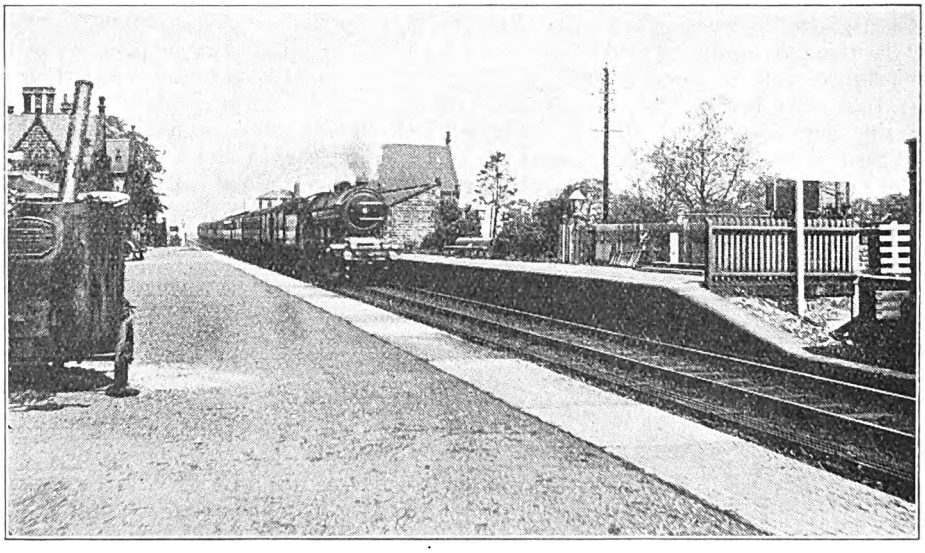

Photo.] [*J. F. Byrne.*

EDINBURGH-KING'S CROSS EXPRESS PASSING LONGHIRST.

North-Eastern 4-6-2 "Pacific" No. 2402, "City of York."

In August, 1888, the East Coast Companies announced that they would carry third-class passengers, to which the West Coast Companies replied that they would reduce their time to nine hours also. The result was an alternate cutting of times by each route.

The best through runs were 412 min. for 393 miles by the East Coast, and 427 min. for 400 miles by the West Coast, which, however, had to climb over Shap summit (920 ft.) and Beattock summit (1,015 ft.), with long luncheon stops at York and Preston on the respective routes.

So far as the North British Railway was

Midland line higher maxima speeds might be, and were, reached any day in the week. The result of this trial was to put the Caledonian on a somewhat stronger footing as regards speed, as a general smartening up of West Coast services followed, and when, a very few years later, the North British Company were able to avail themselves of the Forth Bridge with its connecting lines and of the rebuilt and now double-line Tay Bridge, the competition became keener than ever.

The writer was Resident Engineer for six years or so from 1892 on Scottish railway

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construction, and saw much of what went on.

The opening of the bridges reduced the through routes from Edinburgh to the North by about 21¾ miles to Perth, Inverness and beyond, and by about 28¾ miles to Dundee and Aberdeen and beyond, while the comparative distances from London to Perth, Dundee, and Aberdeen were as follows :—

From	To Perth	Dundee	Aberdeen.
King's Cross	440¾	452¼	523½
Euston ..	450	471	539½

The Midland and Waverley route, of course, shared in the advantages of the shortening of the North British lines to the North. This route was about 15 miles longer than the East Coast line as between London and Edinburgh.

There were, however, some minor drawbacks to the North British northern lines :—

(1) The severe gradients over the Ochill Hills to Perth, with a number of awkward junctions.

(2) North of Dundee (*a*) the route was up a steep gradient from the tunnel under Dundee on to the Dundee and Arbroath Joint Railway, (*b*) the line from Arbroath to Kinnaber junction was single, with severe gradients, and (*c*) from Kinnaber junction to Aberdeen the North British only had running powers over the Caledonian Railway for a distance of about 39 miles.

The best through times by the East and West Coast and Midland routes in the spring of 1893 were as follows :—

	Edinburgh.	Glasgow.	Perth.	Dundee.	Aberdeen.
London—	h. m.	h. m.	h. m.	h. m.	h. m.
Euston, W. Coast.	8 30	8 45	9 55	10 50	12 5
King's Cross, E. Coast.	8 25	9 35	9 45	9 47	11 45
St. Pancras, Mid.	9 45	9 25	11 20	11 35	13 45

At that time the best runs between Edinburgh and Glasgow and the principal centres in Scotland were —

Edinburgh and	Perth.	Dundee.	Aberdeen.	Inverness.
By—	h. m.	h. m.	h. m.	h m.
Caledonian Ry. ..	1 40	2 30	4 15	6 20D
North British Ry.	1 10	1 15*	3 13*	6 10U

* By through night train from London, 4.32 a.m. ex Edinburgh, the other trains were about 15 min. slower.

Glasgow and	Perth.	Dundee.	Aberdeen.	Inverness.
By—	h. m.	h. m.	h. m.	h. m.
Caledonian Ry. ..	1 35	2 10	3 50	5 55 D
North British Ry.	1 55	2 18	4 20	6 15*U

During the 'nineties many miles of new railway were under construction in Scotland. The longest line was the West Highland Railway—an extension of the existing Craigendoran and Helensburgh line of the North British Company through the wild country on the borders of Argyllshire and Perthshire to Fort William on Loch Linnhe at the western end of the Caledonian Canal, which runs through the great glen, cutting Northern Scotland into two masses of mountains.

A line was at one time projected to cut off the detour made by the Caledonian main line between Glamis and Fordoun. A glance at the map will show that a more direct line along the great strath between these points would have reduced the 16½ extra mileage of the Caledonian line to Aberdeen (from London) to about 10. But eventually, as made, this line became merely a local branch from Forfar to Brechin, with an independent line to Edzell from Brechin. Brechin thus became a railway centre with three different branches, all single line, converging on it, two of them by a steeply falling grade with a very sharp curve at the bottom of it.

The Brechin and Edzell traffic had previously been served by a small 'bus, or "machine" (in Southern English a one-horse wagonette), and the writer was greatly surprised when arriving at Euston one night early in August, 1901, after three years' absence abroad, to find on his train (the 8 p.m. Highland express) a large 12-wheeled sleeper labelled "Edzell." This proved to be, not a venture of the West Coast Companies, but a special car for the tenants of Invermark Lodge, 18 miles up Glen Esk from Edzell. The lines in the

* By this train the N.B. Company started their Glasgow train from Perth only 15 minutes after the booked arrival time of the Limited Mail from Inverness, so that the through time must, the writer imagines, often have been exceeded ! The Caledonian thought it prudent, apparently, to wait 20 minutes longer at Perth before starting to Glasgow—thus losing the best "timing" !

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Crieff district were more of a domestic nature, and were in purely "Caley" territory, but in Fife two lines were projected—one from St. Fort at the south end of the Tay Bridge to a junction with the existing line of the North British Company from Ladybank to Perth at Newburgh, thus not only opening up a new district in the north of the "kingdom" of Fife, but giving the North British Company an independent line between Dundee and the Arbroath district and Perth. Between these points the new line is some nine miles longer than the Caledonian, but with easy facilities for running through from Tay Bridge station on to the Arbroath line.

The other line projected was from near Cameron Bridge to the Fife coast line, which would open up a new coalfield and shorten the route to St. Andrews. This line when made, however, was only provided with goods loading banks, and terminated four miles short of the coast line at the N.E. end. Most of the new railways and docks constructed by the two great Scottish companies have been ably dealt with in the pages of the RAILWAY MAGAZINE. The locomotives in use in 1893–94 on the principal services of both these railways were very similar in design, of the "Drummond" family type, but the North British engines had cabs of the round-topped "Stirling" pattern. These engines were of the very useful 4-4-0 pattern, with 6-ft. 6-in. drivers and 18-in. cylinders. There were also a few of the North British engines with 7-ft. driving wheels. Mr. M. Holmes was Locomotive Superintendent at Cowlairs, and Mr. Lambie near by at St. Rollox. The latter, unfortunately, did not long survive, and the advent of Mr. McIntosh in or about 1895 began a new era in Caledonian locomotive practice. The Dunalastairs, with their (for those days) large high-pitched boilers, created quite a mild sensation at the time.

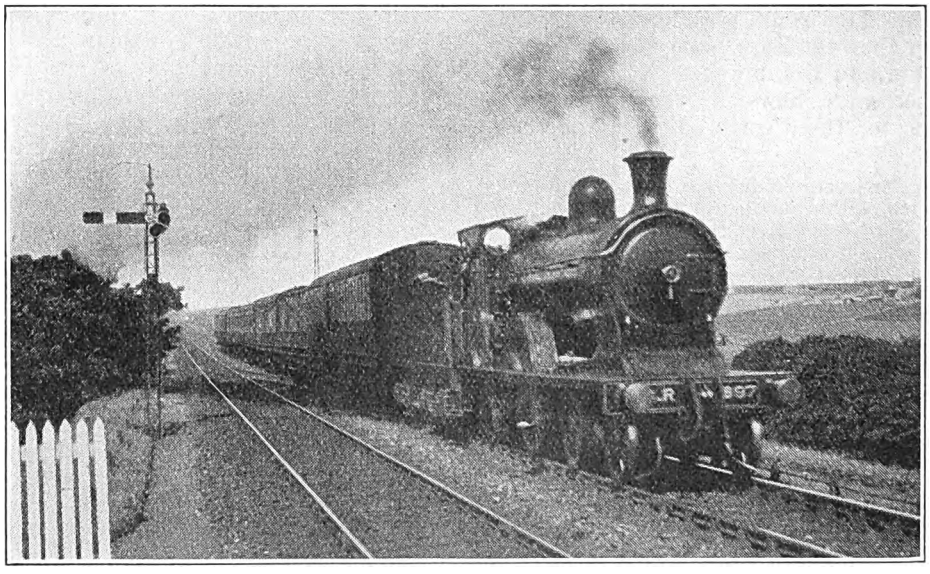

Photo.] [*E. A. Gurney-Smith.*

UP MAIL TRAIN PASSING PORTLETHEN.

Caledonian 4-4-0 engine No. 897.

There were older types running, of which some of the Caledonian seemed the more interesting. Several of Connor's 8 ft. 2 in. singles were still at work and some with 7-ft. wheels. These were on second-class duty in the Arbroath and Montrose district. There were still some 7-ft. coupled 2-4-0 engines working expresses between Perth and Aberdeen, and the writer often travelled behind one on the 4 p.m. from Perth. These were fine engines and speedy, but seemed rather unsteady,

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as is not uncommon with non-bogie engines having outside cylinders and a short wheelbase.

One old North British single-wheeler with about 7-ft. wheels and inside cylinders was to be seen on a Bathgate to Edinburgh train. The well-known 4-2-2 single Caledonian engine No. 123, built by Dugald Drummond in 1886, was seldom seen by the writer on ordinary work, but was used largely on Directors' specials, &c.

Mr. Ahrons' articles have very fully dealt with the locomotives of both railways. Coaching stock of the day was not of a very interesting type. Both companies provided fairly roomy and well-fitted six-wheelers on the main lines, but there were still many antique four-wheelers on the branches. A few bogies were appearing on the Caledonian Glasgow to Aberdeen and Glasgow to Edinburgh services. It should be remembered, however, that the best through trains to and from England were made up of joint stock, built by the North Western for the West Coast and mainly by the Great Northern for the East Coast, and Midland for the other through routes, but it was to be regretted that even on the best East Coast trains in the middle 'nineties, after the conservative North Western had gone in for bogies, there were, apart from sleepers, few coaches other than the regulation E.C.J.S. six-wheelers of Doncaster pattern. For this reason the writer, even when travelling between Edinburgh and London, almost invariably used the West Coast route and travelled in bogie carriages. The journey time was the same except for one or two night trains, and as Edinburgh was the starting point of the south-bound West Coast trains, these were less likely to be crowded than the East Coast trains.

The personnel of the two companies was interesting. On the Caledonian Sir James Thompson was General Manager, Mr. Patrick his deputy, Mr. Irvine Kempt and Mr. George Graham General Superintendent and Chief Engineer respectively. The two latter were of a decided individuality, and the writer has always been glad that he was acquainted with them. Mr. Kempt was very particular about his dress and was as spick and span as an early Victorian dandy with a fob watch chain and, of course, in common with all railway officers of those days, the regulation top hat. His was a charming personality, and many of his men have said in later years that they wished the old times with Mr. Kempt back.

Punctuality was not so absolutely *de rigueur* in the middle 'nineties as it is (supposed to be) now, and there have been known cases where, if important people got the right side of the General Superintendent, they could get the express stopped! That became impossible when the Southron, Mr. Calthrop, came. "Would you believe me, sir, Mr. Calthrop makes us telegraph when we get to the principal stations," said an old Caley guard to the writer at Carstairs once!

Mr. George Graham was of more serious manners, not perhaps so unbending. The writer remembers two idiosyncrasies of Mr. Graham's. One, the enormous time it took to get a reply to a letter! The other, his great and lasting affection for his Balmoral bonnet! When he travelled with an inspection train of officers and it became necessary for the Chief Engineer to get out to look at something, the topper, which he had solemnly worn hitherto, came off and from somewhere a Balmoral bonnet was produced and placed on Geordie's head! The transformation was extraordinary; age seemed to disappear with the topper, and youth and agility reappeared with the bonnet with its tail ribbons!

On the North British Mr. John Conacher had succeeded Mr. John Walker as General Manager, and Mr. Cathles had succeeded Mr. G. B. Wieland as Secretary, the latter joining the Board, and soon afterwards Mr. David Deuchars became Superintendent of the Line. The Chief Engineer was Mr. Carswell, who was succeeded by Mr. James Bell.

The N.B. officers did not seem such a happy family as the Caledonian to those who knew them, and eventually there were changes in the directorate and management. But the redoubtable Mr. Weiland "carried on," while Mr. Deuchars held his office for a considerable period.

A further "race" had taken place in 1895 from London to Aberdeen by the two 8 p.m. trains from Euston and King's Cross respectively. In this the West Coast "won," though their route was 16½ miles

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longer, but the loads hauled were inconsiderable. The through time was 512 min. for the 539½ miles.

Some of the stations in the 'nineties, and, indeed, for many years afterwards, were not creditable to their owners, notably Stirling and Arbroath—both since rebuilt, and now places of joy and beauty! The Caledonian Company, under its late Chief Engineer, Mr. W. A. Paterson, rebuilt many stations as works of art (in which the hanging floral basket almost invariably figured!).

When the writer first met that extremely capable officer he was Assistant Engineer, North Division, and Engineer to Perth Joint Station Committee. Perth station! probably the station with the greatest range of difference in traffic density between winter and summer in the country: deserted in winter for long periods—hours almost—and in late summer the cause of delay as far as the south-west of England, owing to the enormous influx of traffic and the amount of train marshalling which has to be got through before the long trains of through coaches for everywhere can start.

Before closing these notes the writer must recall an experience. The train was the time-honoured 9.5 a.m. ex Perth up to Euston. When running at about 65 m.p.h. between Gretna and Floriston the writer was standing in the corridor with stop-watch in hand, "picking up ¼-mile posts," when he was suddenly overbalanced—a sudden jerk and hiss showed that the couplings had parted, and on looking out of the window the engine and two or three coaches were seen some 30 yards ahead of the main train. By exceedingly good jockey work, the driver of the train kept just ahead till both portions stopped, front portion backed on, coupled up again, and the arrival at Carlisle was just 9 min. late! Incidentally, it may be mentioned that the arrival at Euston was only 5 min. late!

This train, in 1893, stopped 20 min. at Preston, and was due at Euston at 7 p.m. Later, for many years, it became 7.10 at Euston, and now is due at 7.30 p.m.!

AT BRITAIN'S MOST NORTHERLY JUNCTION.

Photo.] [*W. H. Wright.*

REBUILT "BEN" CLASS LOCOMOTIVE AT GEORGEMAS JUNCTION.

L.M.S. Highland Section engine No. 14418, "Ben Mheadhoin."

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

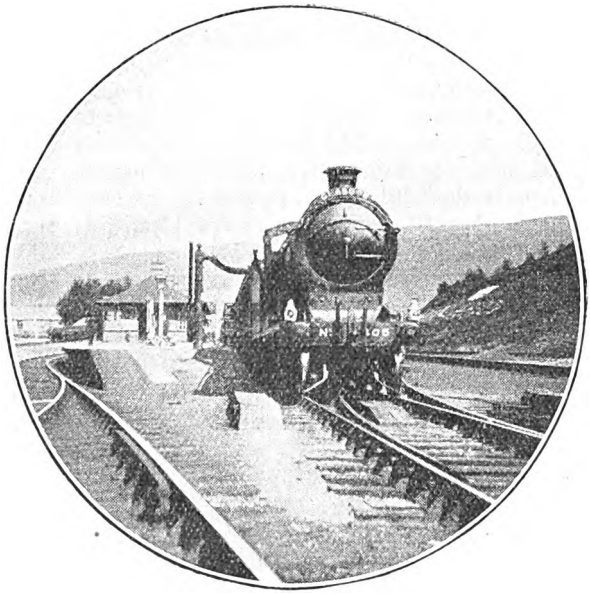

Photo.] [*J. F. Gairns.*

FORT WILLIAM-GLASGOW TRAIN, AT CRIANLARICH, L.N.E.R.

SCOTTISH affairs being the order of the day in the first issue of the New Year, we will turn our attention without delay to recent running over the Scottish railways, which I have been able to observe, if not, perhaps, on so extensive a scale as last year, in at least a fairly comprehensive way. We will commence with the Caledonian section of the London Midland and Scottish system.

In the first table there appears a couple of north-bound runs, from Carlisle to Glasgow. Both were made with very heavy trains—in the first case the 10 a.m. and in the second the 1.30 p.m. from Euston—and both were piloted to Beattock Summit, without any stop at the foot of the bank. The former train, with a conditional stop at Motherwell (generally made), and 139 min. allowed to Glasgow, has an easier time than the latter, whose allowance of 134 min. has to include a regular stop for division at Carstairs, and which is usually the heavier train of the two. The Glasgow portion of the 10 a.m. from London used to be permitted, on its minimum winter loading, to tackle the famous Beattock bank without assistance, but I should imagine that, now a three-coach restaurant car "set" of Midland type has replaced the previous single car, such unassisted running is no longer possible. With a tare load of 324 tons, of course, assistance was essential, although one would have thought it possible to run the train single-headed to Beattock on such a schedule, so as merely to require the services of a "banker" from Beattock to Summit.

The 1 in 100 down out of the platform at Carlisle makes possible an excellent start, and we were doing 64 m.p.h. on crossing the river at Floriston. Up the 7½ miles at 1 in 200 past Gretna we maintained 49½ m.p.h., and, in fact, accelerated again to 50½ at the summit; then we touched 62½ at Kirtlebridge, and breasted the remaining 5¼ miles at the same inclination to Castlemilk at a minimum of 50. Lockerbie was passed at 64 m.p.h., and Nethercleugh at 65; the Annan bridge—the real commencement of Beattock bank, 4 miles below Beattock—was crossed at 65, and really fine work was accomplished in the maintenance of a minimum rate of 55 m.p.h. up the 4 miles in question, mostly at 1 in 202. So, passing Beattock at 55, we fell to 40½ up the 1 in 88 to Auchencastle Box (1¾ miles); to 29 up the ensuing 3¾ miles at 1 in 88–81–79–74 to Greskine Box; we recovered to 31 on the next and

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steeper 2½ miles at 1 in 69–76 to Harthope Box; while the speed was 31½ m.p.h., after the final 2 miles at 1 in 75 average, when steam was shut off for the Summit stop. We stopped 6¼ min. ahead of time, and left 4¼ min. early, but the usual leisurely downhill running, with no higher speeds than 65 m.p.h. at Crawford and 68

L.M.S. (CALEDONIAN SECTION)
CARLISLE–GLASGOW.

Distance.	Engine 4-4-0 No. Load (axles) .. ,, (tons tare) .. ,, (tons full) ..	*116 (PS) 46 324 350	†116 (PS) 50 351 375
Miles.		m. s.	m. s.
0·0	Carlisle	0 00	0 00
4·1	Rockcliffe ..	6 40	6 20
8·6	Gretna	11 10	10 40
13·0	Kirkpatrick ..	16 30	16 00
16·7	Kirtlebridge ..	20 45	20 10
20·1	Ecclefechan ..	24 20	23 35
25·8	Lockerbie ..	30 20	29 25
28·7	Nethercleugh ..	33 10	32 05
31·7	Dinwoodie ..	36 05	35 00
34·5	Wamphray ..	38 55	37 50
39·7	Beattock	44 20	43 10
45·2	Greskine Box ..	53 40	52 00
49·7	Summit ..	62 45 64 45	60 45 63 20
52·6	Elvanfoot	69 30	68 15
57·8	Abington	74 45	73 40
63·2	Lamington ..	79 50	78 35
66·9	Symington ..	83 45	82 25
70·0	Leggatfoot Box ..	87 05	85 40
73·5	Carstairs ..	pass 90 40	90 15 92 35
84·1	Law Junction ..	p.w.s. 104 30	p.w.s. 107 00
89·5	Motherwell	p.w.s. 111 55 113 10	p.w.s. pass 113 30
93·8	Uddington ..	120 25	119 10
102·3	Glasgow	sigs. 137 00	sigs. 132 10

Pilots, Carlisle–Summit:—
* 124. † 123 (McIntosh superheater 4-4-0 type).
PS = Pickersgill superheater.

at Lamington, made us only 2¼ min. early at Symington, passed at 53 m.p.h. After touching 65 m.p.h. at Thankerton and 67 before Carstairs, there was nothing further of interest in the journey, owing to the enforced caution of the running through the colliery areas of Lanarkshire. Despite the Motherwell stop, and very bad signal checks beyond Rutherglen, culminating in a stop of 1½ min., we gained 2 min. on schedule.

The second run, with the heavier load, was much the finer of the two. Despite a slight signal check at Rockcliffe, we attained 65 beyond Floriston, and went up most of the ensuing 1 in 200 at a minimum rate of 50 m.p.h., only falling just at the top to 49½. Touching 66 m.p.h. at Kirtlebridge, we mounted the second 1 in 200 at 53½ m.p.h. minimum, and then reached as much as 68 m.p.h. at Lockerbie, maintaining this speed on to Nethercleugh. Crossing the Annan at 67 (after an intervening "minimum" of 60), we were doing 53½ m.p.h. at Beattock, 38 at Auchencastle, 33 at Greskine and 31 at Harthope, thereby effecting an even better climb than on the previous trip. To pass Beattock in a shade over 43 min. was just like old times, and to arrival at Summit we beat the 67 min. allowed this train from Carlisle (2 min. less than the allowance of the afternoon train) by 6¼ min. Restarting 3¾ min. early, we were only 1¾ min. early at Carstairs, by reason of the usual modest downhill effort; most of the way to Lamington we ran at between 62½ and 64 m.p.h., though we did attain 71½ m.p.h. at the Clyde crossing at Lamington. After that the speed was 51 m.p.h. at Symington and 66 at Thankerton. As usual, the Carstairs-Glasgow run was devoid of interest, being very slow, and also delayed by signals at Newton, but we economised in all 1¾ min. on schedule.

I could not help thinking back, on this trip, to the days when Driver Gibson and *Cardean* used, night after night, to work this express—often with as heavy a load as this and even heavier—on a schedule 7 min. harder, and pilot assistance was never thought of, save, of course, from Beattock to Summit. But downhill speeds were higher in those days, throughout from Summit to Glasgow. Do not let me appear to disparage this run, however; to make Summit in 60¾ min. from Carlisle, negotiating *en route* a clear difference in height of nearly a thousand feet, was a sound performance for two 4-4-0 engines hauling 375 tons between them.

There follow a series of up journeys on the two non-stop trains from Symington to Carlisle in the afternoon—chiefly on the first, or London train. Unfortunately this express so frequently gets away from Symington before the working-book time, that there is seldom any need for excep-

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tional effort; despite apparent losses of time, all these runs gave arrivals at Carlisle either punctual or early. No. 96 attained 64 m.p.h. in the short descent from the start to the Clyde at Lamington and then fell gradually to 54 m.p.h. at Abington, 50½ at Crawford, 47½ before Elvanfoot (with a brief rise to 52 at the highest Clyde bridge), and 33 at Summit—an excellent climb, gaining ¾-min. on schedule. After that we had a p.w.r. check on the bank, went most cautiously down most of its length and had not even reached 60 an hour when we crossed the Annan; then we touched 65 at Nethercleugh, fell to 48½ at Castlemilk and touched 70½ before Kirtlebridge; with a final maximum of 67 after the bad Kirkpatrick check. Net time from Symington would be between 73 and 74 min.

No. 116 was not so energetic. Speeds were 61½ m.p.h. at Lamington, 51 at Abington, 47½ before Elvanfoot and 33 at Summit; then we went with painful caution down the bank (with two reductions to 55 m.p.h.), only just contriving to reach 60 an hour down the tempting 1 in 200 below Beattock. There was really nothing else to note forward to Carlisle, where we arrived a shade before time. With an extra coach No. 14449, on the next journey—timed by a correspondent—did quite well. Speeds were 59 m.p.h. at Lamington, 51½ at Abington, 49½ before Elvanfoot, and 36 at Summit; then came the usual super-cautious descent of the bank, with a speed of 62½ an hour at the Annan and as much as 66 at Nethercleugh, prior to a bad relay check. Before Kirtlebridge 67 m.p.h. was reached, and down Gretna bank the driver permitted himself the unusual luxury of a 74 m.p.h. maximum, 2½ min. being gained thus between Kirtlebridge and Carlisle. I should put the net time on this journey at about 74¼ min.

The load in the last case—also recorded by a correspondent—was so heavy as to call for a pilot from Symington to Summit. The two engines did excellently, with a start-to-stop time of only 22 min. 2 sec. for the 17·2 miles, mostly uphill. At Lamington they reached 61 m.p.h. and the subsequent speeds were 53 at Abington, 49½ before Elvanfoot, 53½ at the last Clyde crossing, and 40 on the final 1 in 99 before shutting off steam for the stop. Then No. 937 did well with this tremendous

L.M.S. (CALEDONIAN SECTION): SYMINGTON–CARLISLE.

Distance.	Engine 4-4-0 No. / Load (axles) / (tons tare) / (tons full)	Schedule.	116 (PS)	96 (PS)	14449(MS)	*937 (PS)
	Load (axles)		44	46	50	58
	(tons tare)		305	315	342	404
	(tons full)		325	330	365	435
Miles.		min.	m. s.	m. s.	m. s.	m. s.
0·0	Symington	0	0 00	0 00	0 00	0 00
3·7	Lamington	—	6 05	5 55	6 10	6 02
9·1	Abington	—	12 10	11 40	12 05	11 50
14·3	Elvanfoot	—	18 55	18 00	18 50	18 02
17·2	Summit	pass.	pass.	pass.	pass.	22 02
		23	23 10	22 20	23 05	23 37
				p.w.s.		
27·2	Beattock	34	34 00	33 45	34 30	34 52
32·4	Wamphray	—	39 25	39 15	39 40	39 37
					p.w.s.	
41·1	Lockerbie	48	48 40	48 05	49 45	48 32
44·2	Castlemilk Box	—	52 35	51 35	53 55	52 23
50·2	Kirtlebridge	57	59 10	57 25	59 45	58 53
				p.w.s.		
58·3	Gretna	65	67 35	67 35	67 10	66 57
64·9	Kingmoor Box	—	74 40	74 00	73 15	73 45
66·9	Carlisle	76	77 30	77 20	76 20	76 42

* Piloted to Summit by No. 777 ("Dunalastair II" class).
PS = Pickersgill superheater type. MS = McIntosh superheater type.

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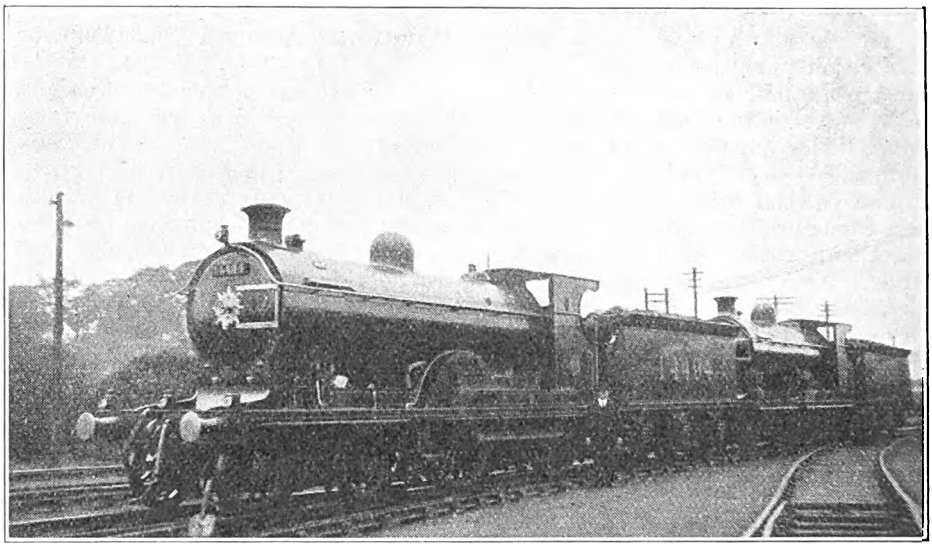

Photo.] **L.M.S. ROYAL TRAIN ENGINES AT ABERDEEN.** [*W. A. Millar.*

Caledonian 4-4-0 locomotives Nos. 14494 and 14495, previously Nos. 89 and 90.

train, unassisted, to cover the 49·7 miles to Carlisle in 53 min. 5 sec. A top speed of 70 m.p.h. was touched momentarily on the bank; at the Annan the speed was 67, followed by speeds round about the mile-a-minute rate on to Lockerbie. Minimum at Castlemilk was 43½ m.p.h., maximum at Kirtlebridge 64 and at Gretna 68, the loss on schedule being very trifling. If only the downhill Caledonian running could be smartened up to something approaching its pre-war standards, the runs would fear nothing by comparison with pre-war achievements.

For the sake of brevity, I have tabulated the two runs from Edinburgh to Symington which preceded the two initial runs in the table last considered. No. 772, during the period last summer when the 1.30 p.m. services from Glasgow and Edinburgh to the South were divided into two parts, at 1.30 and 2 p.m., made a very gay effort on the three-coach 1.30 p.m. out of Edinburgh. Attaining 50½ m.p.h. on a bare 2 miles of level from the start, we fell to 45 up ¾-mile at 1 in 102, recovered to 47½ on the 1 in 143 (3¼ miles) that follows; fell to 46 on the ensuing 2¼ miles at 1 in 134, and then actually accelerated to 52½ m.p.h. up to 2¼ miles at 1 in 220 to near Midcalder Junction, where we were 2 min. ahead of time. On the long stretch of 1 in 100 from there on to Cobbinshaw we fell finally to 40½ m.p.h. The performance up this 16-mile

L.M.S. (CALEDONIAN SECTION)
EDINBURGH–CARLISLE.

Distance.	Engine 4-4-0 No.	Schedule.	775(M)	114(PS).
	Load (axles) ..		18	30
	,, (tons tare)		125	209
	,, (tons full)		135	220
Mls.		m.	m. s.	m. s.
0·0	Edinburgh ..	0	0 00	0 00
1·2	Merchiston ..	—	3 00	3 15
3·0	Kingsknowe ..	—	5 25	5 50
5·5	Currie Hill ..	—	8 45	9 35
7·4	Ravelrig Jc. ..	—	11 10	12 25
10·1	Midcalder ..	—	14 30	16 25
11·3	Midcalder Jc. ..	18	16 00	18 00
15·3	Harburn	—	21 40	24 25
18·4	Cobbinshaw ..	28	26 20	29 40
21·5	Auchengray ..	—	29 30	32 55
25·8	Carnwath ..	—	33 40	36 45
27·4	Strawfrank Jc. ..	38	36 25	38 45
32·1	Thankerton ..	—	43 00	44 05
33·7	Symington ..	47	45 30	46 25

M = McIntosh superheated, "Dunalastair II" class.
PS = Pickersgill superheater type.

absolutely continuous bank was really notable; after that, being still 1¾ min. early, we had no need to hurry. No. 114, on the other hand, had a considerably

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heavier train on the winter working, and lost time to Cobbinshaw, picking it up subsequently. Speeds were 47 m.p.h. on the starting "level," 40 up the 1 in 134, 46 at Midcalder Junction, and 35 at Cobbinshaw, after which we touched 70½ at Auchengray, rounded the curves from Carnwath to Strawfrank rather faster than usual, maintained 50 m.p.h. up to Leggatfoot Box, and touched 64½ at Thankerton, so just reaching Symington 35 sec. inside time. With equally fast running from Cobbinshaw, No. 772 would have completed the journey in 43 min.

My only run on the Caledonian service between Glasgow and Edinburgh has been one on the 9.50 a.m. eastbound train, when No. 14437—a superheated "Dunalastair II"—with a 210-ton train, adhered closely to schedule throughout. We passed Rutherglen, 3·2 miles, in 5 min. 55 sec., at 52½ m.p.h.; Uddingston, 8·5 miles, in 12¼ min., at 57, and reached Holytown, 13·1 miles, in 19 min. 50 sec., speed having fallen to 27 m.p.h. on the 1 in 70 to Bellshill. Then from Holytown we passed Omoa, 2·8 miles, in 7 min., at 29 m.p.h.; regained 43½ an hour at Hartwood and passed Shotts, 7·4 miles, in 15 min. 10 sec., and Benhar Summit, 10 miles, in 19 min. 25 sec., at 37 m.p.h. From there we ran the 7·3 miles to Westcalder very cautiously in 8 min., and the 13·7 miles on to a special stop at Slateford in 15 min. 50 sec. A stop of 25 sec. there, and a time of 5 min. 5 sec. from Slateford into Princes Street made up a total of 71 min. 20 sec. from Glasgow to Edinburgh, inclusive of 45 sec. overtime at Holytown, instead of 70 min. scheduled.

Before I leave the L.M.S. system, I may add a few notes on Glasgow and South Western running. The two runs tabulated, for both of which I am indebted to the kindness of a Dalmellington correspondent, are excellent examples of the work of the rebuilt 4-cylinder 4-4-0 engine No. 394, *Lord Glenarthur*, which has the reputation of being very well liked by the drivers on the Coast section. The 50-minute Ayr-Glasgow run is considerably harder than that in the reverse direction, as there is practically no favourable grade for the first 25 miles out of Ayr, and such fast running as may be made beyond Lochside has to be moderated through Paisley, and over the curved and congested line beyond.

A brilliant start was made on the first run, speed rising to 49 m.p.h. at Prestwick, 54 at Troon Goods, 60 at Barassie and 64½ at Gailes, although the utterly impossible allowance of 7 min. for the first 6·5 miles out of Ayr was still far from kept. But although the engine was somewhat eased after Gailes, schedule

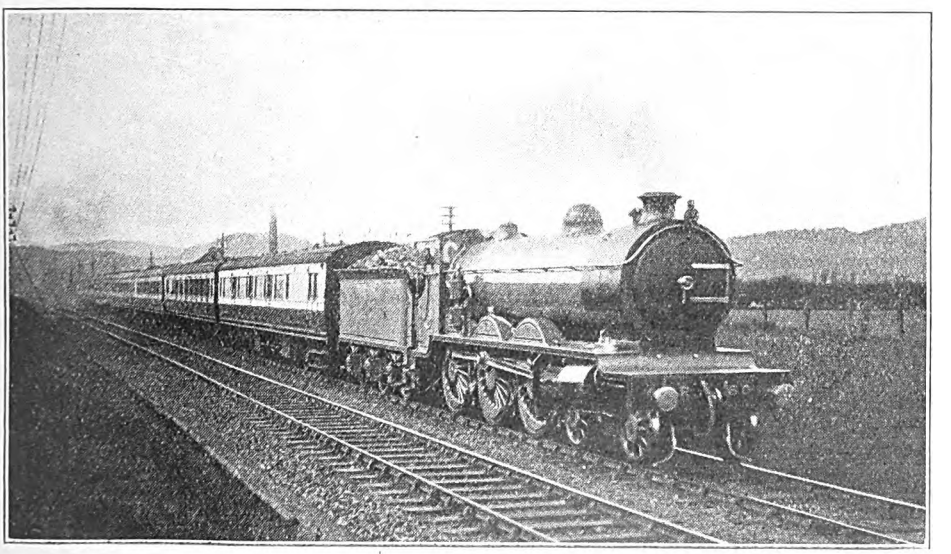

Photo.] ABERDEEN-GLASGOW EXPRESS NEAR STIRLING. [*Henry L. Salmon.*

Caledonian 4-6-0 engine No. 60.

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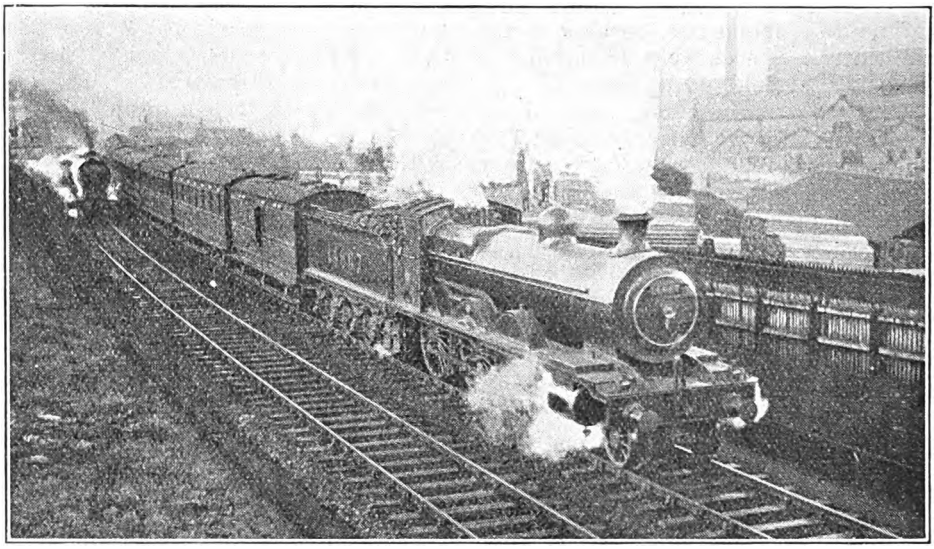

Photo.] **GLASGOW BREAKFAST CAR EXPRESS LEAVING AYR.** [*C. J. L. Romanes.*
G. & S.W. 4-6-0 locomotive No. 14667.

was regained by Dalry, where speed had fallen back to 57 on the slight rise, and thereafter gradually improved on. The rate rose again to 60 an hour at Beith and 63 at Lochside, after which it was maintained at between 63 and 60 on to the service slack to 45 through Paisley. There was a signal slack beyond Ibrox, but for all that St. Enoch was reached in 47 min. 46 sec., or 47 min. net. Even better work was performed on the second journey, with a considerably heavier load. The start was rather slower, with speeds of 44 m.p.h. at Prestwick, 52½ at Troon Goods, 60 at Barassie, 55½ at Irvine, 58½ at Kilwinning and 56½ at Dalry, but some fast running followed. Beith was passed at 61 m.p.h., 65–66½ was maintained from Lochside to Millikenpark, and 69 was touched near Johnstone, while Paisley was passed at a rather higher speed than usual. As a result, 4½ min. were gained on booked time, no less than 7 min. having been cut off schedule from Irvine onwards. On the first run the 24·1 miles from Barassie to Elderslie were run in 23 min. 57 sec., and on the second the 12·9 miles from Glengarnock to Paisley occupied exactly 12 min., at an average of 64·5 m.p.h.

My only recent run on this train was behind a 4-6-0—No. 503—hauling a 42-axle train of 278 tons empty and 300 tons full, but it was rather a dismal performance. It took us 10 min. 35 sec. to pass Troon Goods, and 15 min. 55 sec. to Irvine, where we were 4 min. late, after which we just held our own to Johnstone, passing Kilwinning in 19¾ min., Dalry in

L.M.S. (G. & S.W. SECTION)
AYR–GLASGOW.

Engine: 4-cyl. 4-4-0 No. 394, *Lord Glenarthur.*

Distance.	Driver .. .. / Load (axles) .. / ,, (tons tare) / ,, (tons full)	Schedule.	Taylor. 28 / 177 / 190	Robson Jr. 36 / 240 / 260
Mls.			m. s.	m. s.
0·0	Ayr	0	0 00	0 00
3·1	Prestwick ..	—	5 28	5 40
6·5	Troon Goods ..	7	9 15	9 35
7·6	Barassie ..	—	10 20	10 40
11·2	Irvine	12	13 52	14 31
14·6	Kilwinning ..	16	17 16	18 00
18·1	Dalry	21	20 55	21 42
22·8	Beith	26	25 38	26 25
27·6	Howwood ..	—	30 20	30 50
30·5	Johnstone ..	34	33 08	33 25
33·7	Paisley	38	36 29	36 28
38·2	Ibrox	—	41 50	41 05
			sigs.	
39·8	Shields Road ..	46	43 55	42 50
41·4	St. Enoch ..	50	47 46	45 30

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24 min., Beith in 29½ min. and Johnstone in 37 min. 55 sec. We never so much as touched 60 m.p.h., and were only doing 45 at Prestwick, 50 at Troon Goods, 55½ at Irvine, 50 at Dalry, 53-54 from Glengarnock to Lochside, and 57½ at Johnstone—a poor exhibition. We were practically stopped by adverse signals at Stoneybrae, outside Paisley, and passed Gilmour Street in 43 min. 5 sec., and Shields Road in 51 min. 40 sec., reaching St. Enoch in 55 min. 10 sec. Net time was about 53 min.

South of Ayr some excellent work is sometimes performed on the Glasgow-Stranraer boat service, over a terribly difficult road, and of this my Dalmellington correspondent also sends some striking examples. Two non-stop runs were timed between Ayr and Girvan, on both of which the engine was a Manson 6 ft. 9 in. 4–4–0, rebuilt with the larger Manson boiler; on the first occasion a 28–axle train of 184 tons empty and 200 tons full was carried, and on the second a 35–axle train of 217 tons empty and 235 tons full. A level mile from the start is succeeded by ½-mile at 1 in 88 and 1¾ at 70 up to Dalrymple Junction; on this bank speed fell to 20½ and 13½ m.p.h., the engine in the latter case being probably a little short of steam. Then followed maxima of 56 and 54 m.p.h. on the short descent past Dalrymple. Cassilis bank is 3⅜ miles long, starting with a mile at 150, ½ at 200 and ¾ at 75, while ⅝-mile level and ½ at 80 completes the climb to Maybole. The 1 in 75 was commenced at 47 and 45 m.p.h., and finished at 34 and 29, while the minima at Maybole were 34 and 30½ m.p.h. A mile down at 1 in 63 and another up at 1 in 105 produced maxima of 60 and 58 m.p.h., and minima of 50 and 48, while the maxima on the longer descent to Kilkerran were 70 and 72½ m.p.h. On the broken grades beyond there were no lower speeds subsequently than 48 m.p.h. on both runs, and Killochan bank produced a maximum of 60 m.p.h. on the first run (steam being shut off on the 1 in 72), whereas on the second a top speed of 75 m.p.h.—an unusual experience in this corner of Scotland—was maintained for a full mile.

Times achieved from Ayr were:—8 min. 45 sec. to Dalrymple Junction, 3·3 miles; 12 min. 40 sec. and 15 min. to Cassilis, 6·3 miles; 16 min. 50 sec. and 19 min. 40 sec. to Maybole, 9 miles; 19 min. 30 sec. and 22 min. 35 sec. to mile-post 51¾, 11·2 miles; 24 min. 45 sec. and 27 min. 25 sec. to Dailly, 16·1 miles; 27 min. 43 sec. and 30 min. 10 sec. to Killochan, 18·8 miles; and 31 min. (30¾ min. net, owing to a slight check at Girvan No. 1) and 32 min.

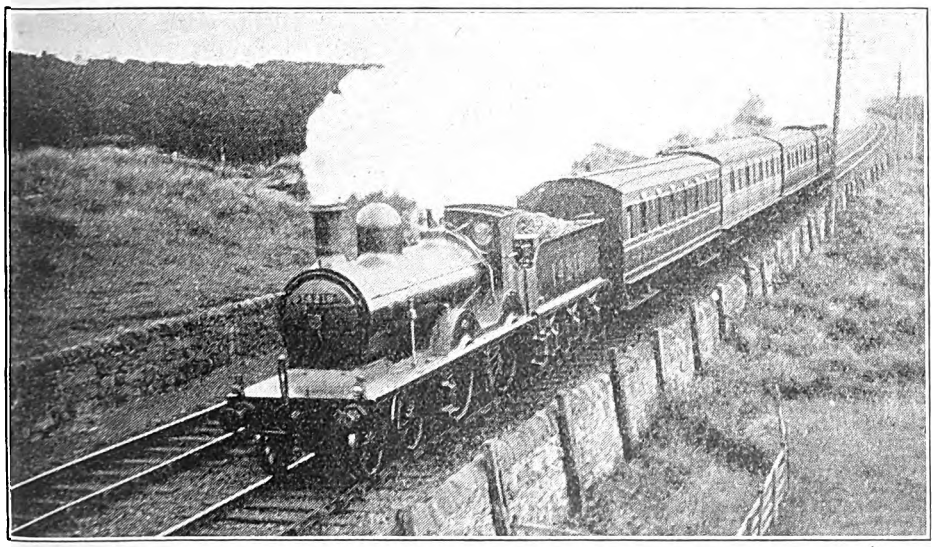

Photo.] AYR–KILMARNOCK TRAIN NEAR TROON. [*C. J. L. Romanes.*

G. & S.W. 4-4-0 engine No. 14216.

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Photo.] [*E. A. Gurney-Smith.*

GLASGOW-OBAN TRAIN LEAVING CONNEL FERRY JUNCTION.

Caledonian 4-6-0 engine No. 197.

50 sec. to Girvan stop, allowed 32 min. It will be noted that on the second run, where the engine had 17 tare tons in excess of the maximum allowed, the 9·7 miles, by no means exclusively favourable, from mile-post 51¾ to Girvan No. 1 box, were run in the smart time of 9 min. 19 sec. Aitken was the driver on the first occasion and Kerr on the second, both of Ayr shed.

The latter continued to Stranraer with a reduced load of 140 tons, over very far harder—indeed, mountainous—grades. From the dead start at Girvan there is, first, a 3¾-mile stretch at 1 in 50-56, on which speed was maintained at 18-20 m.p.h.; mile-post 4, 3·8 miles, was passed in 12¾ min., and Pinwherry, 8·1 miles, reached in 18½ min., with a maximum not exceeding 65 an hour on Pinmore bank, and a severe slack at Pinmore for single-line tablet exchange. From Pinwherry there is a fearsome 7-mile ascent at 1 in 69-67, on which 27 m.p.h. was maintained for many miles, with a falling back to 24½ at the summit; mile-post 15½ (7·2 miles) was passed in 16¾ min. Then came the descent to Glenwhilly, on which speed rose steadily to 76 m.p.h.; slacking again for single-line tablet exchange through that station, the driver then maintained 45 m.p.h. up the 1¼ miles at 1 in 70 following, and touched 74 an hour before New Luce, where again a slack was made for the loop. A maximum of 68 an hour before Challoch Junction completed this surprising speed exhibition; although more creditable than the downhill speed was the excellent work uphill. From Pinwherry, Glenwhilly, 12·6 miles, was passed in 22 min. 47 sec., New Luce, 17 miles, in 27½ min., and Dunragit, 23·7 miles, was reached in 35 min. 40 sec., or 35 min. net (owing to a signal check at Challoch Junction); all slacks included, the 14·3 miles from mile-post 16½ to Challoch were run in 15 min. 5 sec.

Work over the G. & S.W. main line in general compares poorly with such enterprising running as that just described. I was recently on the 11.55 a.m. from Glasgow to Carlisle, with 4-6-0 No. 1466 and a 33-axle train of 200 tons. We made a most leisurely exit from St. Enoch, taking 12½ min. to Barrhead, 7·6 miles, and 22 min. 25 sec. to Caldwell, 12·7 miles, with a minimum of 24 m.p.h. on the 1 in 67–70. Touching 71½ m.p.h. at Kilmaurs we reached Kilmarnock, 24·4 miles, in 34 min. 55 sec.—one minute over time. Cutting the working time-book stop from

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5 to 2½ min., we left 1½ min. early, with 79 min. allowed for the 58·1 miles to Dumfries. Of this total 8 min. are credited to the rebuilding of Mossgiel Tunnel, Mauchline, which involves single-line working, and 3 min. to pitfall restrictions near Cumnock. I doubt whether the two together actually cost us more than 3 or 4 min., but the driver religiously added the remaining minutes to his running time, and we took 5 sec. over the scheduled 79 min. to Dumfries, after the slackest of running throughout. I could not help thinking of the occasion on which Driver Fisher, with the superheated 4-6-0 then numbered 129, took us over the same course with a similar load in a little over 63 min.! From Dumfries we passed Ruthwell, 8·5 miles, in 12 min. 35 sec.; Annan, 15·5 miles, in 19¾ min. (touching 64 on Cummertrees bank); Gretna, 24·3 miles, in 30 min. 10 sec., at reduced speed; and reached Carlisle, 33·1 miles, in 41 min. 10 sec., having at long last gained 50 sec. on schedule, leaving the engine "all square" at the end of the journey. But it was a most uninspiring performance.

Now let us turn our attention to the North British section of the London and North Eastern Railway, dealing first with the Edinburgh–Glasgow services. Considerable interest has centred in these recently, in view of the almost exclusive use of new 4-4-0 engines of the Great Central type. With one exception, I have not noted myself, in some four or five journeys, anything in their performance worthy of particular comment, although that one run, with one timed by a correspondent, is probably the true measure of their capabilities. Four east-bound runs are tabulated herewith. The first, timed by a correspondent, was on the 3.50 p.m. Lothian Coast express, and enjoyed the services of a 3-cylinder N.E. "Atlantic" of Class "Z." The work done was fair, although the load was light; speeds were 51 m.p.h. at Lenzie, 61 at Castlecary, and 61½ at Bonnybridge; after the Polmont check (25 m.p.h.), and another slighter check at Linlithgow, speed rose to 60 at Winchburgh, and again to 62 at Saughton, after a check to about 40 m.p.h. at Ratho. The easy 60-minute schedule was exceeded by only 35 sec., after all these delays, and net time was about 57 min., or slightly over.

My own journeys were on the 8.40 a.m. express, which, if the Lenzie stop be made, is one of the hardest trains to work on the service; the stop was made on one journey only, however, No. 416, *Ellangowan*, of the N.B. superheated "Scott" class, just

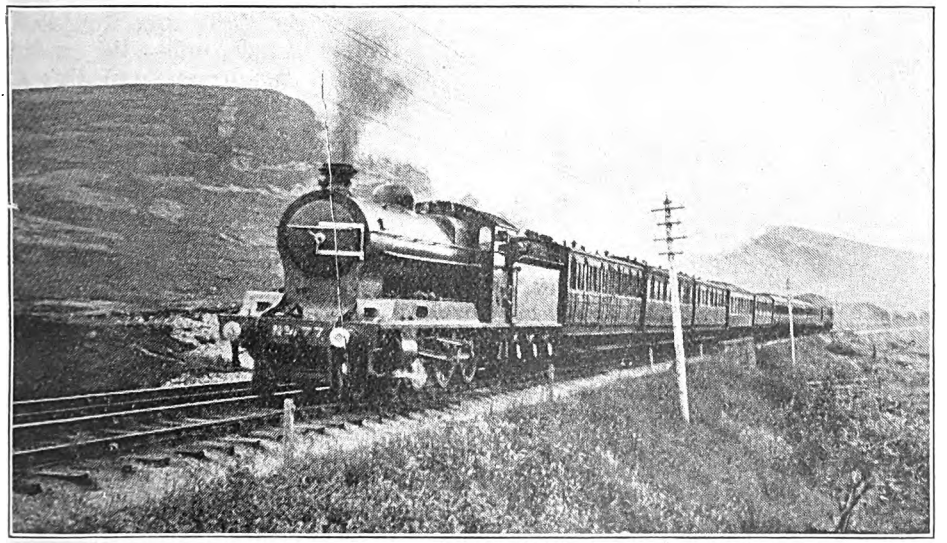

Photo.] [*C. J. L. Romanes.*

INVERNESS-PERTH EXPRESS NEAR DALNASPIDAL SUMMIT.

Highland 4-6-0 locomotive No. 77.

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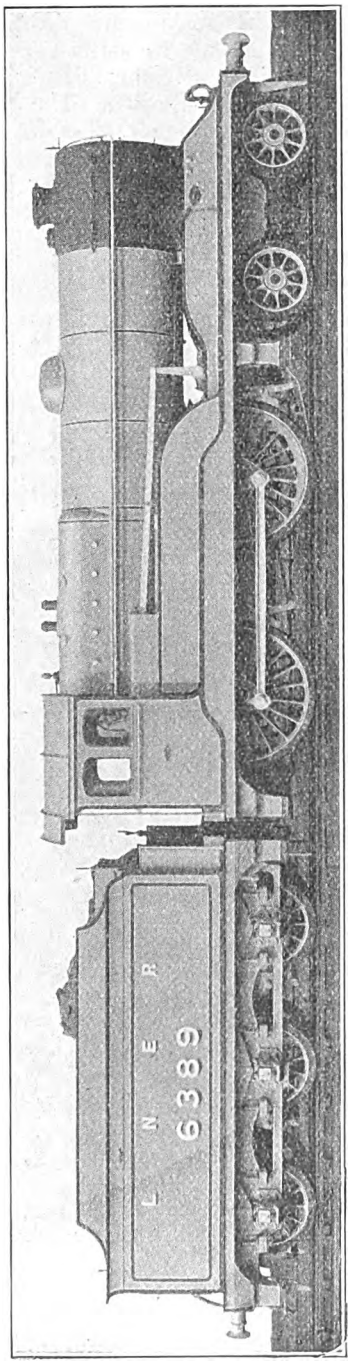
attained 60 m.p.h. at Castlecary and 61 at Gogar, losing 1½ min. to Polmont and regaining them on to Haymarket. No. 6379 of the G.C. type, on her first trip, started very much more slowly up to Cowlairs, but was doing 53 an hour at Lenzie, 57½ at Croy, 65 at Greenhill Upper Junction, and 62½ when steam was shut off for the severe Falkirk Tunnel restriction, so losing about ½ min. net to Polmont. From there to Haymarket there was a gain of 2½ min., and that with no higher speed than 64 an hour at Gogar. The last was, however, much the finest effort. Even inclusive of a 30-sec. stop at Lenzie, our time to Polmont was only 37 min., or 36¼ min. net, with allowance for the tunnel check, and 33 min. net, allowing for stop and check. Speed rose to 65 m.p.h. at Castlecary, and 69 at Bonnybridge. Again, but for the check at Saughton West Junction, we should have made the Polmont–Haymarket run of 22·3 miles in 23¾ min., start-to-stop, at an average of 56·3 m.p.h., speed rising to 56½ m.p.h. at Philpstoun, 61½ at Winchburgh, 67 at Ratho, 68 at Gogar, and 69 at Saughton. The engine, therefore, gained in all 4¼ min. on this journey, and could probably have made a non-stop run into Haymarket in 54 min., with perfect ease.



NEW "DIRECTOR" CLASS 4-4-0 LOCOMOTIVE No. 6389, L.N.E.R.

Some of these engines, adapted to suit the North British loading gauge, are used on the North British Section.

The last of the runs, timed by a correspondent, shows off the capacity of one of the Great Northern "Pacifics." The ascent of Cowlairs bank (which I presume to have been banked in rear as usual), tied with that of the "Director" in the previous column, but the acceleration from Cowlairs onwards was totally unlike the traditional start of N.B. drivers on this road. By Falkirk, indeed, the "Pacific" had caught up the much more lightly loaded N.E. "Atlantic," although no higher speed than 62 m.p.h. had been touched. From Polmont an astonishing start was made, considering the level character of the road, slightly, indeed, against the engine; in the 5 miles to Linlithgow a rate of 61 m.p.h. was attained, while at Gogar the train was doing 66, but the engine was then eased. Otherwise "even time" might have been attained in the first twenty miles. The engine thus gained 1½ min. (net) on the first stage and 2 min. on the second, the actual running time, including Falkirk slack and slowing down and re-starting from Polmont, being only 58 min. 50 sec. Net non-stop time to Waverley would be about 56 min. One could hardly have a more cosmopolitan table of running than that just dealt with.

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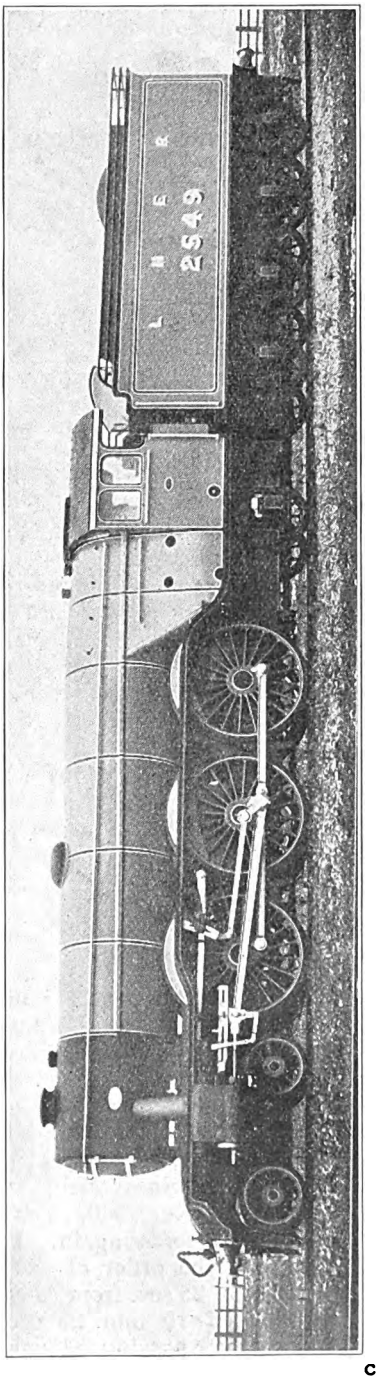
Going west, my two runs on the 6.30 p.m. were devoid of interest. This is nominally a 60-minute train, with conditional stops at Polmont and Lenzie, of which the former is invariably made. Three minutes are allowed for each stop, and the extra allowance seems also invariably made use of by drivers. No. 501, *Simon Glover*—a superheated "Scott"—with a 330-ton train, took 12 min. 20 sec. to Ratho, 22 min. 25 sec. to Linlithgow and 27 min. 40 sec. to Polmont stop, speed increasing from 61 m.p.h. at Philpstoun to 64 at Manuel. The 18·8 miles from Polmont to Lenzie were run in 24 min. 20 sec. start-to-stop, with a maximum of 61 an hour at Croy; and the remaining distance into Glasgow, with the usual crawl down Cowlairs bank, occupied 13¾ min. This made a total, with 65 sec. standing, of 66 min. 50 sec., or nearly a minute over time. No. 6379—"Director"—with 350 tons, took 12 min. to Ratho, passed at 56½ m.p.h., 22 min. 20 sec. to Linlithgow, and again 27 min. 40 sec. to Polmont, speed not exceeding 61 m.p.h. Polmont to Lenzie took 23 min. 35 sec., with a maximum of 61½ m.p.h., and Lenzie to Glasgow 13¼ min.—total, with 50 sec. standing, 65 min. 20 sec.

A correspondent, however, sends details of a fine effort by No. 6382 on the 4 p.m. train, non-stop from Haymarket to Glasgow, with a 340-ton load. Gogar, 4·3 miles, was passed in 7 min. 5 sec., Ratho, 7 miles, in 10 min. 10 sec.; Winchburgh, 10·8 miles, in 14 min. 10 sec.; Linlithgow, 16·4 miles, in 19¼ min.; and Polmont, 21·1 miles, in 23¼ min., speed having risen to a maximum of no less than 72 m.p.h. at Linlithgow. Bad signal checks spoiled the remainder of the run. On another occasion No. 6384 took a 350-ton train from Haymarket to Polmont in 25¾ min., and on from Polmont to Lenzie in 22 min. 25 sec., with a maximum rate of 66 m.p.h. at Croy. So these "foreigners" are acquitting themselves well on N.B. metals, where they have drivers sufficiently enterprising to break away from traditional running.

I have had my usual return trip up the East Coast route from Edinburgh northwards, and have, as usual, found it vastly interesting. Superheated "Atlantic" No. 874, *Dunedin*, with a 230-ton train, made the Edinburgh–Dundee run in 78 min. 55 sec.—a gain of 2 min.—the best feature of the journey, with its heartbreaking series of service slacks and its appalling grades, being the time of 17 min. 25 sec. for the 16 miles from Lochmuir Summit to



4-6-2 LOCOMOTIVE No. 2549, L.N.E.R., AS ADAPTED FOR SERVICE BETWEEN YORK, NEWCASTLE, EDINBURGH AND GLASGOW.

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Leuchars Junction. At Dundee the load was made up, by addition of the Glasgow portion, to 300 tons, and No. 9869, *Bonnie Dundee*, was substituted for No. 874. Time was gained on every section without exception, the 17 miles to Arbroath taking 22 min. start-to-stop, instead of 23; the 13·6 miles over Lunan Bay summit into Montrose 21 min., allowed 22; the 24·4 miles from there, with a 17-mile climb *en route* to Drumlithie, to Stonehaven 34¾ min., in place of 36; and the final up to Drumlithie, and of 8¾ min. from Montrose up to 85¾ mile-post summit, being all first-class achievements. All the way back also we gained time; the 54 min. taken from Aberdeen to Montrose was 4 min. under schedule, the 20 min. 40 sec. from there to Arbroath just inside the 21 min. booked; and the 21 min. 55 sec. from Arbroath to Dundee a minute under the time allowed.

At Dundee No. 9877, *Liddesdale*, and a small re-built Holmes 4-4-0, No. 9595,

L.N.E.R. (N.B. SECTION): GLASGOW–EDINBURGH.

Distance.	Engine No. / Load (axle) / ,, (tons tare) / ,, (tons full)	Schedule.	*714 / 35 / 265 / 283	Distance.	Schedule.	†416 / 44 / 326 / 340	§6379 / 44 / 326 / 345	§6379 / 44 / 330 / 350	¶2567 / — / 310 / 330
Miles.		min.	m. s.	miles.	min.	m. s.	m. s.	m. s.	m. s.
0·0	Glasgow	0	0 00	0·0	0	0 00	0 00	0 00	0 00
1·5	Cowlairs	7	5 15	1·5	7	6 20	7 00	6 05	6 00
6·2	Lenzie	pass. / 13	pass. / 12 03	6·2	pass. / 13	pass. / 14 05	pass. / 14 25	13 40 / 14 10	pass. / 12 50
11·4	Croy	—	18 01	11·4	—	20 25	20 10	22 25	18 30
15·5	Castlecary	—	22 07	15·5	—	24 55	24 10	26 30	22 30
21·8	Falkirk	—	28 35	21·8	—	31 35	30 35	32 25	28 40
25·0	Polmont	pass. / 33	p.w.s. pass. / 33 00	25·0 / 0·0	34 / 0	p.w.s. 36 30 / 0 00	p.w.s. 36 05 / 0 00	p.w.s. 37 05 / 0 00	p.w.s. 32 50 / 0 00
29·7	Linlithgow	—	sigs. 39 35	4·7	—	7 15	7 20	7·20	5 50
32·8	Philpstoun	—	43 10	7·8	—	10 45	10 45	10 40	9 05
35·3	Winchburgh	—	45 50	10·3	—	13 30	13 25	13 15	11 40
39·1	Ratho	48	sigs. 50 00	14 1	18	17 25	17 10	16 50	15 20
43·8	Saughton	—	55 00	18·8	—	22 10	21 45	21 05	20 15
46·1	Haymarket	—	57 20	21·1	27	25 30	24 25	sigs. 24 30	22 30
47·3	Edinburgh	60	60 35	—	—	—	—	—	26 00

* N.E. 3-cyl. 4-4-4, Class "Z." † N.B. 4-4-0 Superheated "Scott" class.
§ G.C. 4-4-0 "Director" class ¶ G.N. 4-6-2 type.

16·2 miles into Aberdeen 22 min. 35 sec., scheduled 23 min. Locomotive gains from Edinburgh thus totalled 5¾ min.

Coming south on the 7.35 p.m. "sleeper" we had a 54-axle train of 400 tons gross weight, and were piloted throughout, the engines being non-superheated 4-4-0 No. 340, *Lady of Avenel* and *Bonnie Dundee* again. Excellent climbing was the order of the day, the times of 13 min. 25 sec. from Aberdeen to mile-post 234, of 10 min. 25 sec., for the 7·2 miles from passing Stonehaven took charge, and made some most spirited running, gaining 3½ min. to Thornton Junction. The 15·5 miles from St. Fort to Ladybank Junction were run in 16 min. 10 sec., and the time of 35¾ min. from the start to Thornton, 28·5 miles, was really excellent, in view of the load and the intervening difficulties. After this we ran a good deal more easily, but we were still 3½ min. early at Haymarket, and would have made the run from Dundee into Waverley in 79 min., but for delays outside the latter station. I hope to describe these runs in fuller detail later

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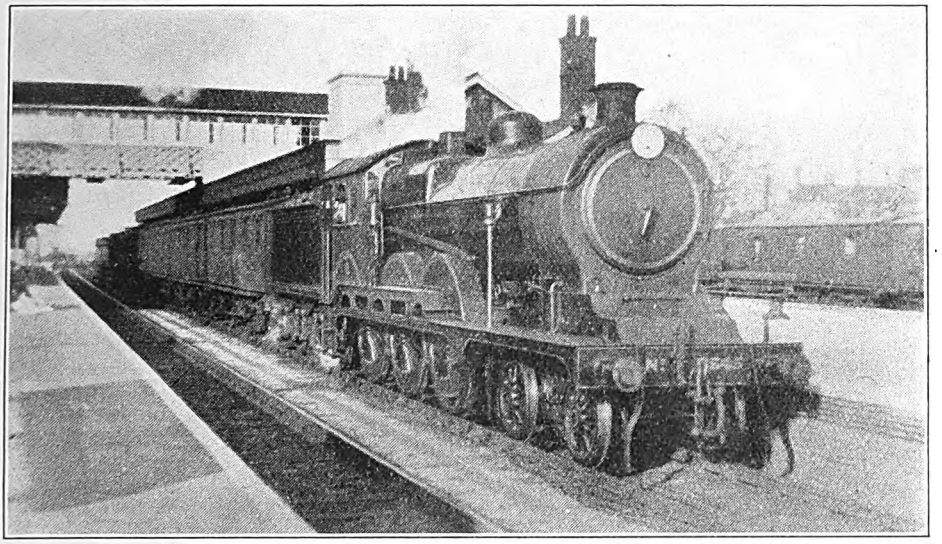


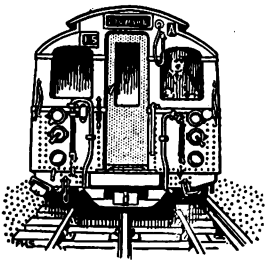
Photo.] [*G. H. Young.*

UP STOPPING AND MILK TRAIN AT WITHAM JUNCTION. L.N.E.R.

Great Eastern 4-6-0 locomotive No. 8545.

on in the year, with some also over the Waverley route between Edinburgh and Carlisle.

Before closing, I want to draw attention to a slight error which crept into the tabular matter last month, relative to my footplate journey on the "Cornish Riviera" express from Paddington to Plymouth. In the table of times, the time to Westbourne Park (although correctly shown in the general table of four "Riviera" runs as 3 min. 15 sec.) is given incorrectly as 2 min. 39 sec. Wonderful as are the capabilities of the "Castles," I think we have yet to see the day in which a single-headed train of 500 odd tons will cover the first 1¼ miles of a level start in just over 2½ minutes! In view of the passenger complement, which was very heavy, I should also have been more accurate had I given the gross weight of the train from the start as 530 tons, instead of 525 tons. The difference is small, but it affords yet another five tons of credit to the astonishing performance of *Pendennis Castle*.



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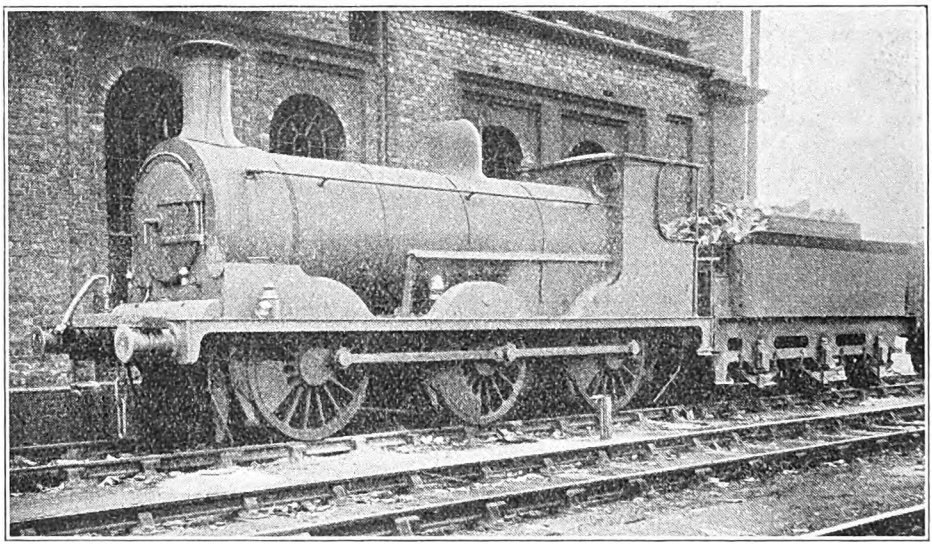
STROUDLEY GOODS ENGINES, CLASS C 1.



WE are indebted to Mr. O. J. Morris for the photograph reproduced, showing the last engine of Mr. Stroudley's C 1 class goods engines. No. 430 is now, we understand, stationed at New Cross, where it was photographed by permission of Mr. A. D. Jones, Locomotive Running Superintendent, Southern Railway. Mr. Morris sends the following particulars :—No. 430 was one of 12 locomotives built at Brighton between 1882 and 1887, being enlargements, so to speak, of the original design initiated by Mr. Stroudley in 1872.

The C 1 class, at the time of their appearance, were about the most powerful goods locomotives in the country, and had the large heating-surface of 1,413 sq. ft. This was much greater than that of the later C 2 class goods engines, introduced by Mr. R. J. Billington, Mr. Stroudley's successor, wherein the heating-surface was only 1,211·5 sq. ft. The boiler of No. 430 dates from June, 1887, when the engine was built, and blows off at 150 lb. per sq. in., the Stroudley spring-balance safety-valves being retained. Cylinders are 18¼ in. in diam., with a stroke of 26 in., the weight of the engine is 40 tons 10 cwt., that of the tender, loaded, 32 tons 15 cwt., a total of 73 tons 5 cwt.

The tender is of Mr. Stroudley's original type, introduced in 1872, or thereabouts, for the engines of the 2-4-0 "Goodwood" class, although he had built a very similar, but smaller, tender for his first 0-6-0 goods engines in 1871. A type of tender similar to that of No. 430 was illustrated in the picture of *Westminster*, RAILWAY MAGAZINE, February, 1919, page 89, save that, in the reproduction alluded to, the springs are above the framing, whereas in the tender of No. 430 they are underslung. The Standard Stroudley tender has the bearings inside, and is fitted to the engines of the "Gladstone" class. The numbers of the C 1 class ran from 421 to 432, both inclusive, and the only other survivor of the class, No. 428, was sold to the S.M.J. Railway in 1920.

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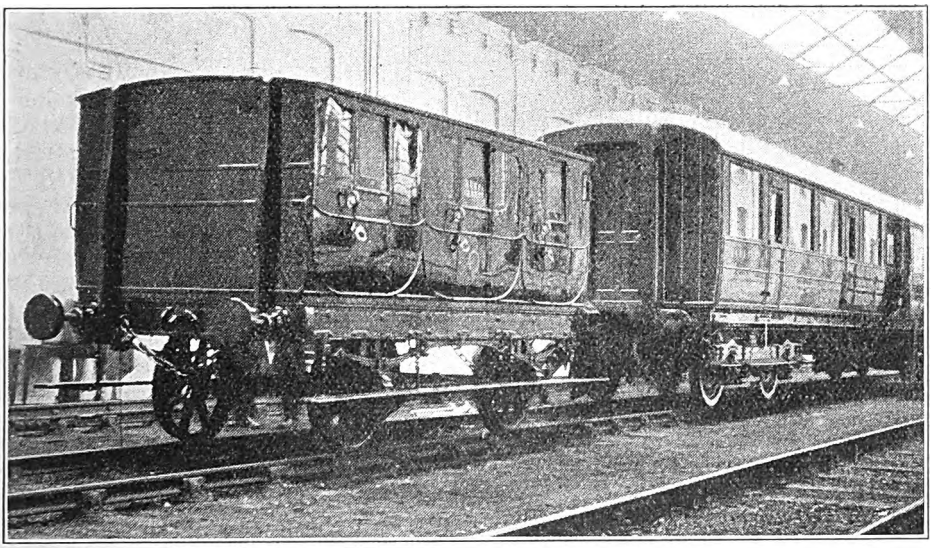

Photo.] [*P. Ransome-Wallis.*

OLD STOCKTON AND DARLINGTON COACH AS EXHIBITED AT YORK, NOVEMBER 29, 1924.

1825-1925.

I.—THE ROMANCE OF THE RAILWAY CENTENARY.

By the EDITOR.

THERE must be very few of our readers, including those who have lived long enough to see their sons and daughters grow up to be men and women, to whom the existence of railways and the availability of railway transport for almost any desired journey, has not, from their earliest years, constituted a commonplace of life. Indeed, among the younger readers particularly, the only personal recollections of the construction of new railways relate to tube and underground extensions and the opening of an occasional light railway or branch line.

For practical purposes, so far as our own recollections are concerned, the great trunk lines, not only of this country, but also of the world in general, might have been in existence for centuries, for aught we know to the contrary, except on the basis of historical record. It is, in fact, almost impossible for any one of the present generation to realise that, for all practical purposes, virtually the whole history of railway development is covered within the relatively short period of little more than 100 years, and that the Railway Centenary, to be celebrated this year, is concerned with railway development from small and actually very crude beginnings no farther back than 1825.

Yet the early stages occurred in many cases within the lifetimes of our grandfathers and grandmothers, and, in some instances, within the recollections of our fathers and mothers, while the inauguration of railways in other lands, and the construction of certain main sections even of the British railway system, has, in a number of cases, taken place within the knowledge of not a few of our readers, and then not necessarily those greatly advanced in years.

The story of railway development is, indeed, romantic in every sense of the word. Within this period of 100 years has been condensed a degree of progress which, so far as reasonable comparisons can be made with other branches of

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THE
STOCKTON & DARLINGTON
RAILWAY COMPANY
Hereby Give Notice,

THAT the FORMAL OPENING of their RAILWAY will take place on the 27th instant, as announced in the public Papers.—The Proprietors will assemble at the Permanent Steam-Engine, situated below BRUSSELTON TOWER,* *about nine miles west of* DARLINGTON, *at eight o'clock, and, after examining their extensive inclined Planes there, will start from the Foot of the* BRUSSELTON *descending Plane, at nine o'clock, in the following Order:—*

1. THE COMPANY'S LOCOMOTIVE ENGINE.
2. The ENGINE'S TENDER, with Water and Coals.
3. SIX WAGGONS, laden with Coals, Merchandise, &c.
4. The COMMITTEE, and other PROPRIETORS, in the COACH belonging to the COMPANY.
5. SIX WAGGONS, with Seats reserved for STRANGERS.
6. FOURTEEN WAGGONS, for the Conveyance of Workmen and others.

☞ *The WHOLE of the above to proceed to STOCKTON.*

7. SIX WAGGONS, laden with Coals, to leave the Procession at the DARLINGTON BRANCH.
8. SIX WAGGONS, drawn by Horses, for Workmen and others.
9. Ditto. Ditto.
10. Ditto. Ditto.
11. Ditto. Ditto.

The COMPANY'S WORKMEN to leave the Procession at DARLINGTON, and DINE at that Place at ONE o'clock; excepting those to whom Tickets are specially given for YARM, and for whom Conveyances will be provided, on their arrival at STOCKTON.

TICKETS will be given to the Workmen who are to dine at DARLINGTON, specifying the Houses of Entertainment.

The PROPRIETORS, and such of the NOBILITY and GENTRY as may honour them with their company, will DINE precisely at THREE o'clock, at the TOWN HALL, STOCKTON.—Such of the party as may incline to return to DARLINGTON that Evening, will find Conveyances in waiting for their Accommodation, to start from the COMPANY'S WHARF there precisely at SEVEN o'clock.

The COMPANY take this Opportunity of enjoining on all their WORKPEOPLE that attention to *Sobriety* and *Decorum*, which they have hitherto had the Pleasure of observing.

The COMMITTEE give this PUBLIC NOTICE, that all Persons who shall ride upon, or by the sides of, the RAILWAY, on Horseback, will incur the Penalties imposed by the Acts of Parliament passed relative to this RAILWAY.

RAILWAY OFFICE, *Sept. 19th, 1825.*

* Any Individuals desirous of seeing the Train of Waggons descending the Inclined Plane from ETHERLEY, and in Progress to BRUSSELTON, may have an Opportunity of so doing, by being on the RAILWAY at ST HELEN'S AUCKLAND not later than Half-past Seven o'clock.

REDUCED FAC-SIMILE OF THE PLACARD NOTIFYING THE OPENING OF THE STOCKTON AND DARLINGTON RAILWAY.

industry, is almost, if not quite, unparalleled. It is true that it is now the fashion in some quarters to speak of railways as being antiquated, inefficient and out of date, and to anticipate that, before another 100 years have passed, steam locomotives, if not their electric successors also, will be found only in museums or erected on pedestals at airship stations or in public parks. It is, however, beyond question that, while the steamship has provided rapid and reliable transport between countries and continents, the railway has rendered equal if not greater services in supplying means of transport on land, as well as serving as a collecting or distributing medium for the traffic upon which overseas and ocean transport depends.

How great the transformation effected by railways actually is, can only be realised when one takes into account the tremendous differences between the industrial situation which existed in 1825, the conditions under which people lived, worked and spent their lives, and the relatively small scale upon which practically everything was then carried on, and the position which obtains to-day, when there is a considerable admixture of nationalities and a continual transfer of people from one place or country to another. In addition, the population has increased enormously, with the result that large residential areas have been opened up, from and to which workers travel daily by means of the railway, whereas, in the old days, ordinary people depended upon employment in the vicinity of their homes, the idea of travelling other than a reasonable walking distance to and from business being practically unknown. People did travel about to some extent, it is true, but they were mainly those of the richer classes, or a few adventurous spirits of the same kind as those who now regard the whole world as open to them.

In its inception the railway was introduced with a view to the conveyance of coal, stone, &c., from a colliery, quarry, or other place of origin, to the waterside, thus utilising what was then regarded as the best, if not the only, means of transportation for distances other than a few miles. It was from that point of view, in fact, that canals were projected and largely constructed in so many directions during the early days of the last century. Canals presented a much better means of inland communication than the relatively crude roads of those days, and for some time railways were subject to adverse comparison with schemes for canals, until it came to be realised that canals could not surmount steep gradients, except by expensive and complicated means, whereas railways were beginning to show that their development in regard to routes from any one place to practically any

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other was, relatively speaking, unlimited.

A natural development of the original idea of a railway as a means of connecting a colliery or quarry with the waterside was that it could be adapted to provide for conveyance between large towns and centres of industry. The general idea for quite a considerable period was, however, that the railway was essentially a means for carrying minerals and goods, though utilisation for passenger traffic also was an early development. Consequently, while the Stockton and Darlington Railway, opened on September 27, 1825, was designed and laid out for the conveyance of mineral traffic, we find that almost—if not quite—from the beginning limited passenger services were run, though by means of a horse-drawn vehicle, the locomotives being reserved for the more important work of hauling coal. When the Liverpool and Manchester Railway was projected the passenger element was more pronounced, in that rapid (according to the views of those days) communication between the two great cities named formed a principal reason for the construction of that line.

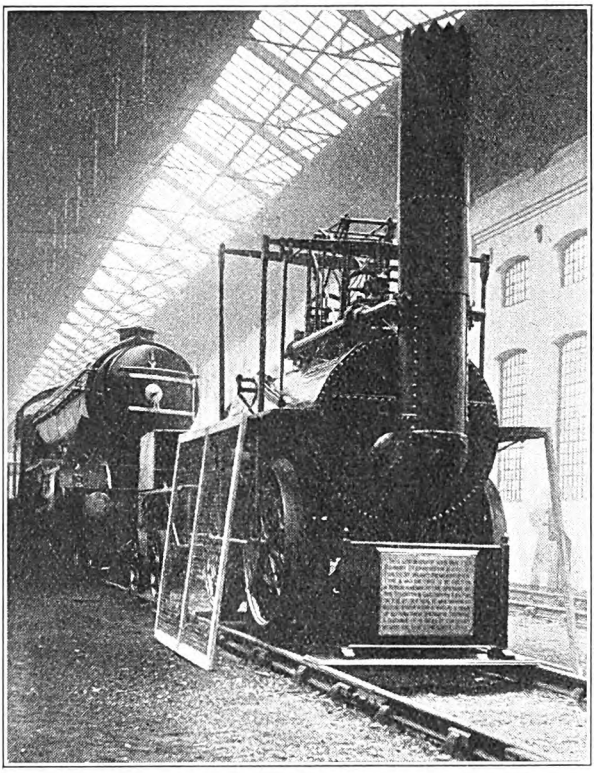

Photo.] [*P. Ransome-Wallis.*

"LOCOMOTION" AND THE "FLYING SCOTSMAN" AS EXHIBITED AT YORK, NOVEMBER 29, 1924.

Whether considered from the point of view indicated by the Stockton and Darlington Railway—essentially a coal-carrying line, with passenger conveyance as a side issue and conducted on a very small scale—or from that of the Liverpool and Manchester Railway where passenger traffic was from the first a principal consideration, the fact remains that from those small and (to modern ideas) very crude beginnings has developed the wonderful network of railways covering Great Britain, and the tremendous mileages of railways to be found in all principal countries in the world, together with important, though in some cases relatively small, lengths of railway in the as yet undeveloped lands.

It is necessary to recognise, however, that while the Stockton and Darlington is generally credited with the honour of initiating the world's railway system, it was by no means the first railway, neither was it the first line upon which steam locomotives were employed. In fact, the famous engine *Locomotion*, No. 1 in the stock of the Stockton and Darlington Railway, was not even the first engine to be built by George Stephenson, who, in his turn, was not the actual inventor of the locomotive, though that honour is often attributed to him. Trevithick, Hedley, Blackett and other pioneers had already provided a groundwork for development and improvement at his hands and by other engineers concerned with locomotive construction and operation during that period.

Trevithick's first engine, were it still in existence, would be 120 years old, while George Stephenson's first engine had been in service 12 years when the Stockton and Darlington line was opened. There were, indeed, at least a dozen, if not more, railways in existence and in operation

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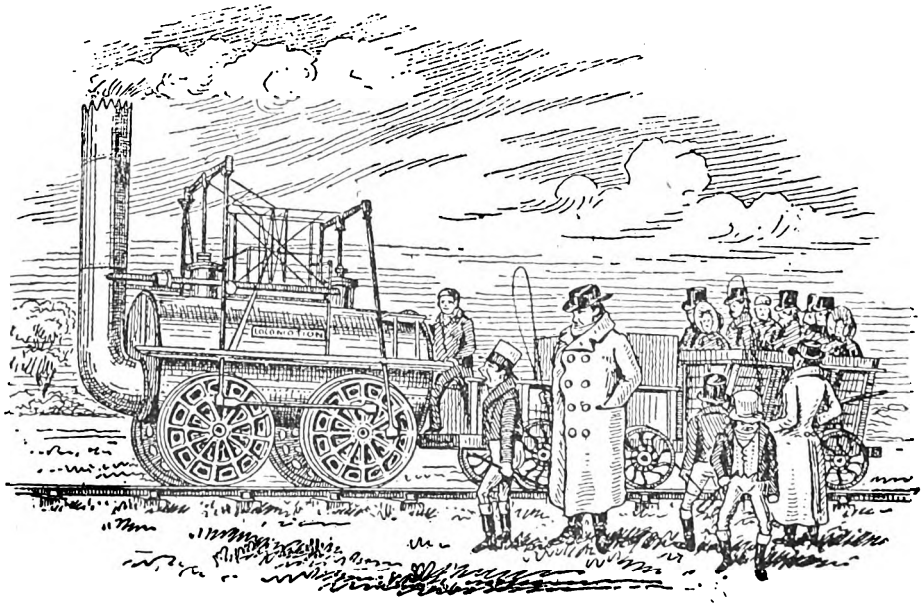
prior to the projection, let alone the completion, of the Stockton and Darlington Railway, while steam locomotives numbered a score or so. Moreover, the Stockton and Darlington was not the first railway to be constructed under Parliamentary powers, that honour, as explained later by one of our contributors, belonging to the Surrey Iron Railway, constructed in 1801 and opened in 1804. Prior to the construction of the Stockton and Darlington Railway, however, all railways except the Surrey line were private ones, built to meet the needs of colliery, quarry and other industrial firms, and none of them was entitled to convey paying passengers, although, no doubt, on occasions they carried employees and their families and friends as unofficial passengers. The Surrey Iron Railway was intended only for the conveyance of goods traffic, and, like several other railways of those early days, was laid out more particularly to provide a route upon which vehicles belonging to traders and others were allowed to travel on payment of toll charges.

In the case of the Stockton and Darlington Railway, however, the company was definitely organised for the purpose of conveying public traffic, and with rights in regard to the conveyance of passengers, thus according with the general principles upon which railways are organised and operated to-day. The company was itself prepared to supply wagons for the carriage of coal, though it also hauled private owners' wagons, and it supplied locomotive power. On the Surrey Iron Railway, horse-power was used from the earliest days until the line closed down after a precarious existence of some 50 years or so. It was on the Stockton and Darlington Railway, too, that George Stephenson came principally into public notice, and for practical purposes his *Locomotion* for that line started a trend of locomotive development which, in conjunction with the important share to the credit of Timothy Hackworth, is quite as important and interesting historically as that associated with the more advanced work of George Stephenson and others concerned with locomotive development on the Liverpool and Manchester Railway, together with the London and Birmingham, Grand Junction, and other lines with which it eventually became associated.



AN EARLY SKETCH OF "LOCOMOTION," AND SOME DISHEARTENED ONLOOKERS.

(*From an Old Print.*)

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Naturally, in those early years, both locomotive design and construction and railway operation would appear, to modern ideas, to be crude in the extreme. There was, indeed, a considerable public opinion definitely opposed in principle to railways, and landowners and others frequently did all they could to hamper their construction. It must be admitted that many of the early engines were distinctly erratic, and it was many years before locomotives began to assume a presentable appearance or to work continuously without breakdowns at unduly frequent intervals. Freight rolling-stock consisted usually of very small wagons, not dissimilar to those to be found in and about collieries to this day, while passenger vehicles were little better than boxes on wheels, though the adoption of the stage coach type of construction provided, comparatively early, first-class and in some instances second-class passengers also with very creditable accommodation.

It must be remembered, too, that trains were usually few and far between, "expresses" stopped at all principal stations and were reserved for first-class, or first and second-class passengers, sometimes with the payment of supplementary fares, while anything in the nature of suburban traffic was entirely unknown. Trains usually worked more or less by sight, though the introduction of "policemen" at junctions, and the provision of signals of elementary forms, first at stations and then also at junctions, constituted the beginnings of signalling as understood to-day. These refinements, however, followed gradually, and it is surprising to find that, even in the 'fifties and 'sixties, when locomotive design and traffic operation had advanced considerably, signalling and operating methods generally still depended very largely upon observation by enginemen and correct working by train and station staffs with little or nothing in the way of safeguarding appliances.

It is difficult, indeed, to realise that, for so long, traffic was operated by these relatively crude and, as they would now be regarded, inadequate methods, seeing that the only brake power available was that of the engines and vans, notwithstanding that fast travelling was by no means unknown, and there were, even before the 'sixties were out, quite creditable express train services on most of the main routes.

Another remarkable feature is the rapidity with which so many of the main routes of the country were built up, so that it is substantially correct to claim that the principal components of the railway network of to-day were constructed between 1825 and 1855. While, however, the locations of the main routes are, generally speaking, unaltered, they have all been developed so greatly that few, if any, indications of their early condition now remain, and as a result of extensions and new construction year by year the British Isles have become covered with systems of lines which can hardly be paralleled, for a corresponding area, in any other part of the world.

Progress in other lands has, of course, been very similar, as the older countries rapidly followed the lead given by Great Britain, so that, before 1850, nearly all had considerable lengths of railway. There are, however, parts of the world where railway construction was not inaugurated until comparatively lately, though one of the most notable aspects of railway development is the extent to which the construction of railways has been undertaken with a view to opening up new countries, providing a permanent means of intercommunication where otherwise a journey of any length was necessarily an arduous undertaking, and for supplying means for collecting and distributing the products of various countries for use by the world generally. In later years, railways have rendered invaluable though now somewhat inadequately appreciated services by enabling people to live away from their places of employment, thus permitting of the extension of residential areas to meet the needs of the increasing population. Further, as a result mainly of the development of railways, industry has been enabled to increase its scale of operations, and, incidentally, to provide employment, and to supply the needs of distributing and other businesses on a scale which extends far beyond anything which the pioneers of the railway could have conceived possible. Railways may, indeed, be said to constitute the veins through which flow the life-blood of British industry and trade, and, despite the anti-

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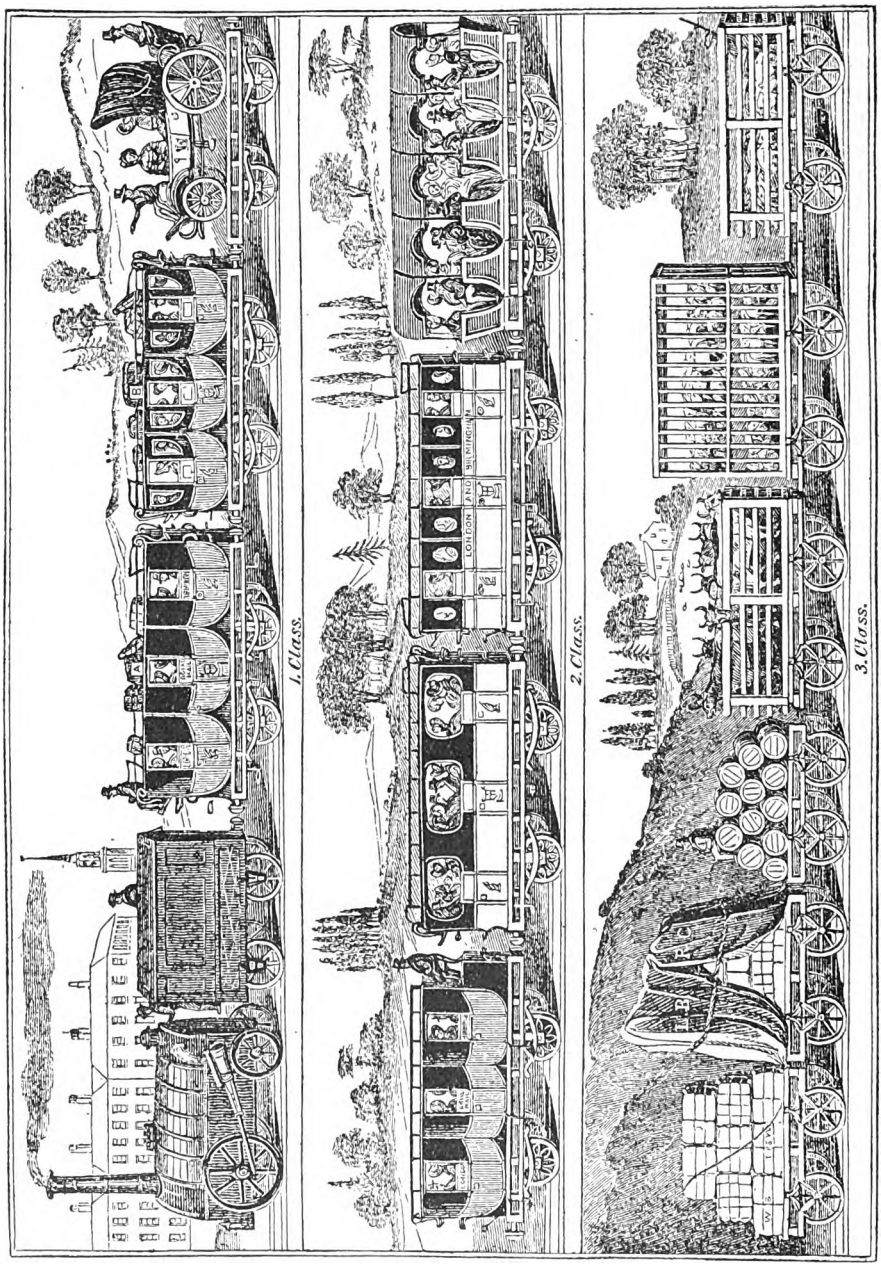
cipations of those who hold the opinion that motor road or aerial transport will one day supersede the railway, any prospects that such results will follow appears still to be very remote indeed.

There is much truth in the oft-quoted remark attributed to the late John Bright: "Railways have rendered more service and have received less gratitude than any other institution in the country." In themselves, however, railways have come to be the largest industrial corporations and the most extensive employers, other than the State itself, while it is generally recognised that, as the leading public service institution, their well-being is



EARLY ROLLING-STOCK AS USED ON THE LONDON AND BIRMINGHAM AND LIVERPOOL AND MANCHESTER RAILWAYS.

(*From "The Mirror," July 22, 1837.*)

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essential to that of the nation as a whole. It is not surprising, therefore, that while, in large measure, the services rendered by railways are now regarded as commonplaces of life, there is a considerable public which is keenly interested in all that appertains to railways, their material, equipment and operation.

In following articles authoritative contributors will deal with various aspects of railway development during the last 100 years, the whole constituting an entrancing story, while in our summer numbers we hope to deal fully with the special arrangements which have been and are being made in connection with the centenary celebrations in the Stockton and Darlington district and the special Congress of the International Railway Association to be held in London.

II.—BUILDING UP THE BRITISH RAILWAY SYSTEM.

By G. A. SEKON.

Although the Stockton and Darlington was the first public railway in the world to carry passengers* under Parliamentary sanction, it may be mentioned that, prior to the incorporation of the company, various canal companies had obtained powers to lay down eight lengths of railroads, whilst Parliament had sanctioned no fewer than twenty railways, apart from the canal lines. These railways were chiefly for coal and/or for other mineral traffic, and required the authority of a Statute to enable the owners to lay the lines across private property, and along public highways, as construction of this character could not be carried out without Parliamentary authority.

Amongst these *ante*-Stockton and Darlington lines was the Surrey Iron Railway, the first *railway* to receive Parliamentary sanction, which it did in 1801. The line commenced at Wandsworth and the portion opened extended to Croydon; the gauge was 4 ft. Another, the Sirhowy (1802), was mostly a plate railway, but the branch to Trevill was an edge railway. Others included the Kilmarnock and Troon (1808) and the Plymouth and Dartmoor (1819). Many of the early railways were constructed for the purpose of conveying coal, &c., from the mines to a convenient shipping place on a navigable river or other waterway, and the Stockton and Darlington Railway was of this character. A suggestion for a railway "or canal" from Stockton through Darlington to Winston was made in September, 1810, and a committee was formed to look into the matter. The decision arrived at in 1813 was in favour of a canal. In 1816 the proposal had crystallised into a scheme for communication partly by railway and partly by canal. On September 4, 1818, a meeting was held at Darlington at which it was decided to seek powers for a canal or railway between that town and Stockton. A meeting on November 13 decided upon the railway. The Bill was duly deposited, but thrown out on the second reading on April 5, 1819, by a majority of 13 votes.

Alterations were made in the course of the line, and this amended Bill would have been deliberated upon by Parliament early in 1820, but the death of George III on January 29 made its consideration, in view of the dissolution, so unlikely that the measure was suspended for that year. Various alterations in the course of the line were made in the Bill that came before the Commons and was read a third time on April 12, 1821. Quickly passing through the Lords, the Stockton and Darlington Railway Act (1 and 2 Geo. iv. c. 44) received the Royal Assent on April 19. In the various sections and schedule of tolls, no reference was made to the conveyance of passengers.

The Act merely contemplated a railroad over which any one would run vehicles, upon payment of a charge per ton per mile, varying with the material carried.

* The 13th Act for a railway (passed in 1811) authorized the conveyance of passengers on the Berwick and Kelso Railway, but this line was never constructed. Passengers were occasionally carried on some of the earlier tramroads, but apparently not on a fare-paying basis.

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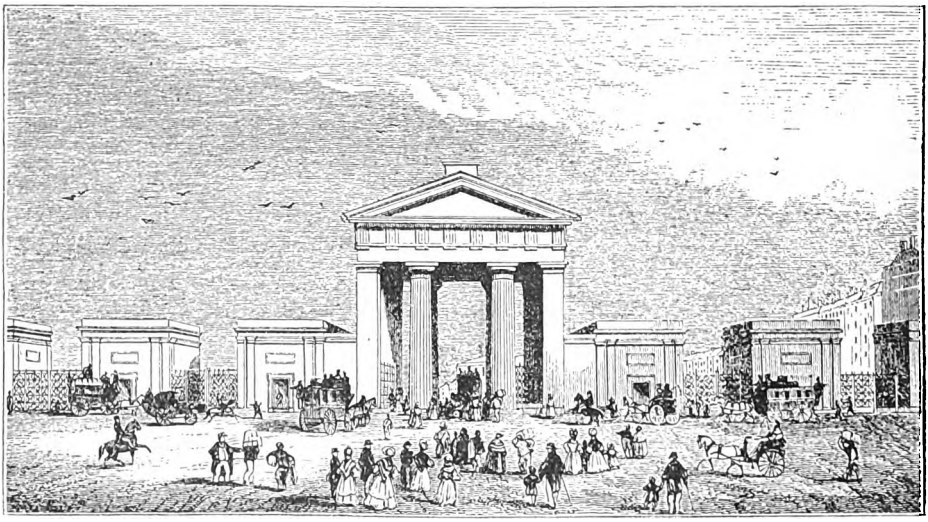
The toll for coal, coke, &c., was 4d. per ton per mile, whilst 6d. was the charge for lead, bar iron, wood, &c. The railway was to be laid out with inclined planes, and 1s. per ton was to be paid for all goods conveyed over these inclines. We see, therefore, that from the first Parliament accepted the view that works on a railway, if of an expensive character, or which were costly to operate, were entitled to a charge over and above the usual toll.

It is impossible in this article to refer to the many clauses which, 100 years after their drafting, strike one as curious. The railway, like the public parks to-day, was only to be open during certain hours according to the season. November to February, 7 a.m. to 6 p.m.; March, April, September and October, 6 a.m. to 8 p.m.; and from 5 a.m. to 10 p.m. May to August inclusive. Overton, a South Wales engineer, had laid out the course of the railway, but before construction was commenced Edward Pease, a Quaker who had invested largely in the undertaking, sent for George Stephenson. In the course of the interview Stephenson suggested that locomotives should be used on the railway.

Up to this time it had been proposed to lay the line as a plate (or tram) road, but on the suggestion of William James, an engineer even then interested in railway development, edge rails were decided upon. George Stephenson, for a fee of £140, made a fresh survey of the line in October, 1821, being assisted by his son Robert, who thus at the age of 18 obtained his first experience in railway surveying. George Stephenson was appointed engineer in January, 1822, and on May 13, 1822, a start was made with the construction of the Stockton and Darlington Railway, the formal inauguration of laying the first rails taking place on May 23 at Stockton. The gauge was 4 ft. 8 in.—½ in. less than usually supposed.



ENTRANCE TO EUSTON SQUARE STATION AS FIRST ERECTED.

(From Osborne's "London and Birmingham Railway Guide.")

In the Bill deposited for 1823—made necessary by the deviations decided upon as a result of George Stephenson's survey—was a clause authorising the use of "loco-motive, or moveable, engines" on the railway. The Act which received the Royal Assent on May 23, 1823, also authorised the levying of a toll of 6d. per mile on every "coach, chariot, chaise, car, gig, landau, wagon, cart or other carriage using the railway for the conveyance of passengers or parcels." The first two locomotives for the line were ordered of R. Stephenson and Company in September, 1823, at a cost of £500 each.

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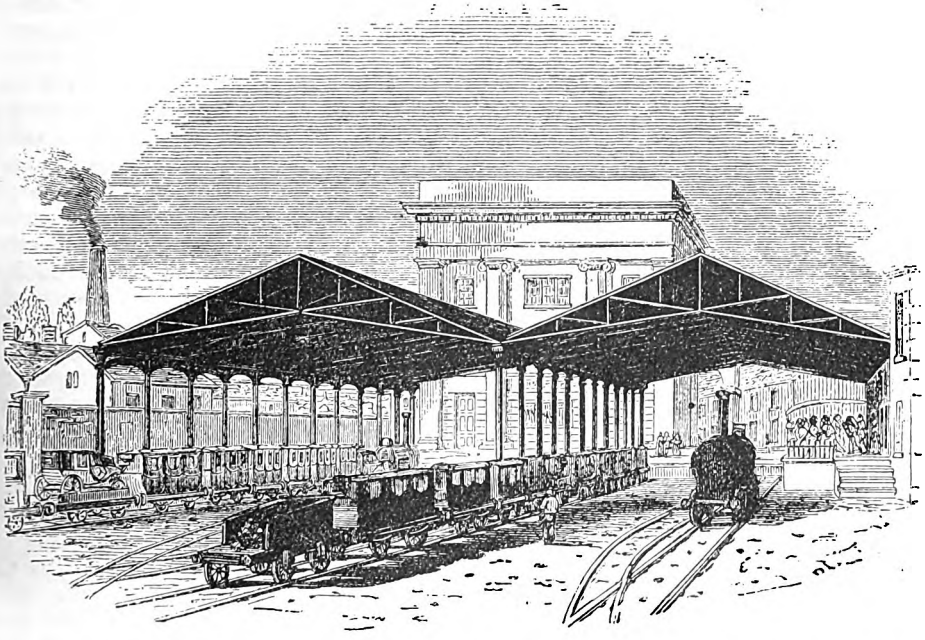
After various *contretemps* which had delayed the work, on September 27, 1825, the official opening took place. The main line was 25 miles in length and three branches increased the total length to 26¾ miles. For the first 20 miles from Stockton the gradient did not exceed 1 in 104, and in the next 5 miles were two inclined planes worked by stationary engines. At the opening the S. and D. Railway possessed the "improved travelling engine" (*Locomotion*), one passenger coach (*Experiment*)* and 150 coal wagons. The wonderful enthusiasm kindled by the opening of the line, and the success of the historical ceremony, are well known.

One other railway was sanctioned by Parliament in 1821, a horse line from Stratford-on-Avon to Moreton-in-the-Marsh, opened in 1826. No new railways were sanctioned till 1824, when Acts were obtained for the Monkland and Kirkintolloch Railway, 12 miles long, on which it was proposed to employ locomotives, and the Redruth and Chasewater Railway, 14 miles long, closed in 1915. In 1825 eight railway Acts were obtained, including the Bolton and Leigh, Cromford and High Peak, Rumney, and Canterbury and Whitstable.

1826 was a year busy with applications to Parliament for railway Acts. Of the ten sanctioned in that year, the Liverpool and Manchester was the most important. It proposed to connect the chief provincial port of the country with the biggest provincial manufacturing town, but the great innovation was that of carrying passengers. Goods were to be carried as on the 34 railways previously authorised by Parliament, but the great feature was the conveyance of passengers. The strenuous opposition to the scheme can be but faintly realised after the lapse of so many years. Not only did the landed proprietors and ignorant country people fight against it, but the powerful monopolists, who controlled the lucrative water routes between Liverpool and Manchester, offered most vehement and persistent



THE ORIGINAL BIRMINGHAM STATION OF THE LONDON AND BIRMINGHAM RAILWAY.

(*From Osborne's "London and Birmingham Railway Guide."*)

* This was not a species of caravan as usually illustrated, but more like a stage coach with a door at each end, inside and outside seats, and a table down the centre inside.

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Opening

OF

THE LIVERPOOL AND MANCHESTER

RAILWAY,

WEDNESDAY, 15TH SEPTEMBER, 1830.

CHAS. LAWRENCE, CHAIRMAN.

THE BEARER OF THIS TICKET IS ENTITLED TO SEAT No.

NORTH STAR'S TRAIN.

YELLOW FLAG.

ENTD._____

INVITATION TICKET TO TAKE PART IN THE OPENING OF THE LIVERPOOL AND MANCHESTER RAILWAY.

The Doors of the Station in Crown-street, Liverpool, will be open at Nine o'Clock in the Morning, and the Company are requested to assemble not later than Half-past Nine.

Carriages to approach by way of Crabtree-lane, and to set down with the Horses' Heads towards the Botanic Garden.

*** Please to show the Ticket at the Door, but not to part with it.

On the return, the Procession will move down the great Tunnel to the Company's Warehouse-Station in St. James's-street, from which Street Carriages must enter the Yard, and be in waiting at Four o'Clock with the Horses' Heads towards Wapping.

BACK OF INVITATION TICKET.

FRONT AND BACK OF INVITATION TICKET TO OPENING OF LIVERPOOL AND MANCHESTER RAILWAY.

opposition to the railway, which they recognised as a rival to the canals, a rival offering moreover quicker and better means of transport. The stage coach and van proprietors, when they knew the railway sought to convey passengers, were equally antagonistic to the scheme. It had not taken lawyers long to recognise that fat fees could be extracted by organising opposition to railway schemes, and doubtless much of the resistance that the Liverpool and Manchester Railway and later Bills met with was largely influenced by the circumstance that big bills of costs would result therefrom. The original prospectus of the Liverpool and Manchester Railway was dated October 29, 1824. The annual traffic was estimated at £400,000. The capital was soon subscribed. The original route was surveyed by William James, but for the line for which an Act was sought George Stephenson was engaged as engineer, and he modified the course selected by James.

Looking back upon the extraordinary opposition with which the scheme was met in Parliament, most probably this was due in part to the fact that George Stephenson was the principal witness in its favour. There can be no doubt that he possessed first-rate qualifications for the position of engineer—possibly none had better—but his appearance, his manner, the quality of his speech and his northern dialect were of a character previously unknown to Parliamentary Committees. Opposing counsel were quick to perceive the sub-conscious prejudice thus created. Stephenson's appearance and manner had the effect upon the counsel of applying their skill rather to belittling the railway's engineer than to a serious criticism of the scheme. The lawyers, however, did not always score in these wordy encounters, for when Stephenson had become used to the strange surroundings, he was not infrequently more than a match for the Parliamentary Counsel.

The first Bill, which went into Committee on March 21, 1825, was thrown out on May 30. For the 1826 Bill a new survey was made, and in view of the sorry figures presented by Stephenson as a Parliamentary witness, George and John Rennie were appointed engineers to the railway, whilst Charles Vignolles was responsible for the plans and sections. The preamble of the new Bill was declared proved on March 16, 1826, and the Act received Royal Assent on May 7, 1826. George Stephenson was appointed engineer at an annual salary of £1,000. Big engineering works had to be carried out, difficulties such as the crossing of Chat Moss—which with the limited experience and inadequate machines then available, appeared unsurmountable—were overcome and the railway, 30 miles long, constructed.

The question of tractive power arose.

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Some suggested horses; even if locomotives were adopted, stationary engines for the incline plane were looked upon as necessary. Opinions of the leading engineers were sought, but on March 27, 1828, the directors ordered a locomotive from Stephenson. Opposition to the locomotive still continued, and as the directors desired to be quite certain that locomotives could be depended upon as reliable under the exacting and varying conditions of everyday work, on April 30, 1829, they announced the offer of a prize of £500 for the locomotive which on trial was adjudged to fulfil most satisfactorily the conditions of the contest. There were four steam locomotives entered. The trials took place on various days from October 6-14, 1829, Stephenson's *Rocket* being awarded the prize.

Several additional engines were ordered, and the official opening took place on September 15, 1830. A gloom was cast over the festivities by the death of Mr. Wm. Huskisson, Member of Parliament for Liverpool, who had done much to help the Bill through the House of Commons. He was knocked down by the *Rocket*, receiving injuries which caused his death. The success of the first real passenger railway was phenomenal. The estimates of revenue put the passenger traffic as likely to produce £10,000 a year; but the first year's income from passengers amounted to £101,829.

The first railway to be opened in the South of England was the Canterbury and Whitstable, connecting the Ecclesiastical Metropolis with its port. The event took place on May 3, 1830. The line was worked partly by stationary engines and partly by a locomotive, *Invicta*, still preserved in the Dane Jon Gardens, Canterbury.

Between the passing of the Act for the Liverpool and Manchester Railway and its opening, 23 additional railways were authorised by Parliament. Several of these were short railways connecting with, or in the neighbourhood of, the line of the Liverpool and Manchester Railway. Outside this district there were two of more than local importance.

The principal of these was the Newcastle and Carlisle Railway, authorised in 1829; this was the longest line so far sanctioned, its length being 61 miles, but the original capital was only £400,000. The line was partly opened in March, 1835, and throughout in June, 1838. The Newcastle and Carlisle was a successful undertaking and was paying 8¼ per cent. when amalgamated with the North Eastern Railway in 1862. The Act incorporating the Newcastle and Carlisle Railway contained a clause that "no locomotives or moveable steam engines" were to be employed, but in spite of this restriction the directors ordered locomotives, and commenced to work the line with them. An injunction was obtained and the railway closed on March 28, 1835. Fortunately, the objector was induced to withdraw this opposition, and the locomotives reopened the line on May 6, 1835.

The Leeds and Selby Railway, incorporated in 1830, was opened in September, 1834. This line was 20 miles long and had no platforms at either terminus. With the Hull and Selby authorised in 1836 and opened in 1840, through railway communication was effected between the important port of Hull and the busy manufacturing district of which Leeds is the centre. The gauge of the Hull and Selby Railway was 4 ft. 9 in., and the line was noted for being very straight and level. The Leeds and Selby Railway afforded a striking lesson as to the inutility of raising fares as a means of increasing revenue. From May to October, 1836, when the fares were 4s. first-class and 3s. second-class, 60,439 passengers were carried. In 1837 the fares were raised to 5s. and 4s. During the corresponding six months the number of passengers was only 41,830. The fares were then reduced to 4s. and 3s., and from May to October, 1838, 60,174 passengers were conveyed, but the receipts were £1,078 less than in 1836, because the higher fares of 1837 had caused many first-class passengers to travel second-class, and this they continued to do when the fares were replaced at the lower level of 1836.

In 1831 an Act was obtained for a railway from Manchester to Sheffield, but this line was not constructed, being superseded by the Sheffield, Ashton-under-Lyne and Manchester Railway, incorporated in 1837. The latter in 1846 amalgamated with others, and became the Manchester, Sheffield and Lincolnshire

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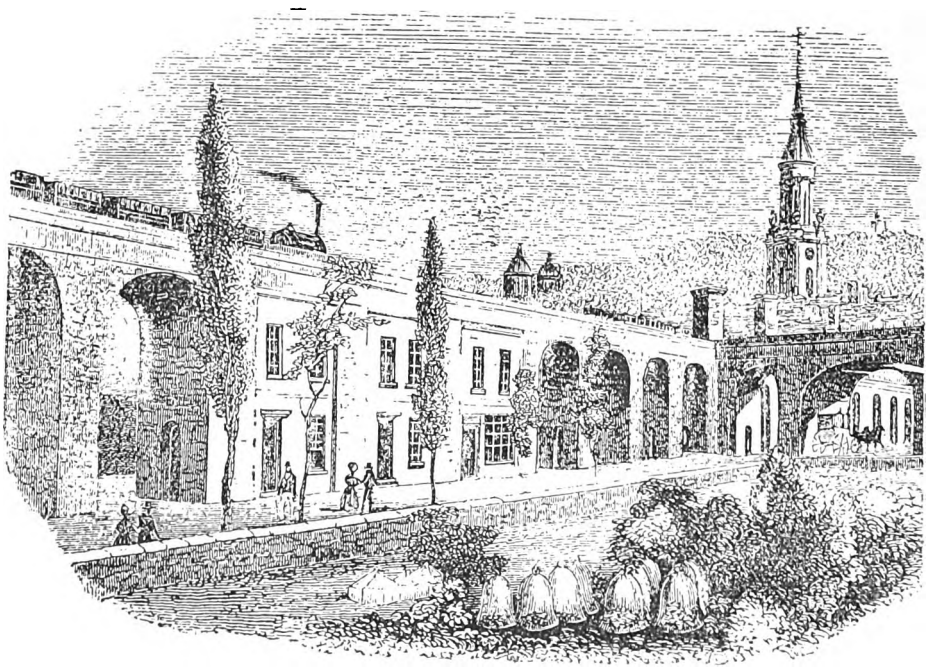
Railway, and obtained fame in connection with the summit tunnel at Woodhead, 3 miles 13 yards long—a remarkable length in those days, and still the fourth longest tunnel in Great Britain. The first single-line tunnel at Woodhead was opened December 22, 1845.

From 1831 and onwards the sanctioning by Parliament of railways was not infrequent. Most of the lines within the next few years were merely of local importance, but in later years became portions of well-known systems. Probably the first amalgamation occurred in 1834, when the Wigan Branch Railway, seven miles long, with a three-mile branch, authorised in 1830 and opened September, 1832, and the Preston and Wigan, 15½ miles, incorporated in 1831, became the North Union Railway. On the other hand, some of the early railways have had what amounts to an almost independent existence up to the present. The Bodmin and Wadebridge, incorporated in 1832, and opened in 1834, was not physically connected with the L. and S.W.R. (which acquired it in 1845) till 1895. A coach and section of permanent way of the B. and W.R. are preserved and exhibited at Waterloo station, London, and enable us to realise in a measure what railway rolling-stock was like ninety years ago. The Festiniog Railway, with a gauge of 1 ft. 11½ in., authorised in 1832, is still independent, though in 1923 it entered into a working arrangement with other narrow-gauge lines in the district.

The year 1833 saw the incorporation of the London and Birmingham, Grand Junction, London and Greenwich, and two other railways. From a national viewpoint the most important of these was the London and Birmingham, although the Greenwich Railway was the first Metropolitan line, and introduced features that were looked upon as novel at a time when all that appertained to railways were novelties. The course of the London and Greenwich Railway was on a viaduct throughout its whole length. It was proposed to let the arches (over a thousand) as dwelling-houses. It provided a shorter route to Greenwich than the highway, and



ARCHES OF THE LONDON AND GREENWICH RAILWAY UTILISED AS DWELLING HOUSES.

(From an Old Print.)

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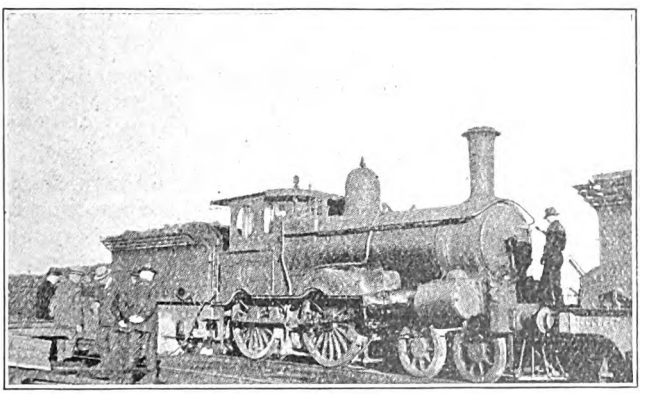
a pathway was provided on the ground alongside for pedestrians, who were expected to pay a toll because of the distance saved. To prevent the trains toppling over the viaduct a peculiar type of carriage was employed, with the floors only a few inches above the rail level. Bands, with the musicians dressed in scarlet to resemble beefeaters, played the trains out of the termini. To save expense, after a short time the band was replaced by a barrel-organ at Greenwich. It was assumed that the novelty of a railway would be a leading attraction of London, and that all visitors—estimated at three millions a year—would make at least one trip over the line.

The London and Birmingham Railway was of great importance because by its promotion it was recognised that railway communication between the Metropolis and the big provincial business centres was necessary. The first attempt to obtain Parliamentary sanction was made in 1832, when the Bill was passed by the Commons, but was thrown out by the Lords on the opposition of the landowners. Success attended the Bill in 1833, the compensation for land having been increased from £250,000 in 1832 to £750,000 in 1833. This brought the estimate for the cost of the line up to about £3,000,000 for 112½ miles, though it actually involved about 5½ millions. The annual gross revenue was put at £671,102. Robert Stephenson was the engineer. The London terminus was to be at Camden Town, but powers were obtained to bring the line to Euston, down a gradient in part as severe as 1 in 62 (worked from the opening of the line till 1844 by stationary engines). The engineering works were on a colossal scale—big tunnels at Primrose Hill and Kilsby, huge cuttings at Tring, Blisworth and Roade, with gigantic embankments such as those at Wolverton and Tring. Several contractors were ruined in endeavouring to carry out the construction of these extensive works. The Kilsby tunnel, 2,400 yards long, for which the original contract was £99,000, cost £300,000 to make. The line was opened in sections, the first on July 20, 1837, between Euston and Boxmoor and throughout to Curzon Street, Birmingham, on September 17, 1838. Edward Bury for some years provided the locomotive power by contract, and during this period only four-wheel engines were employed (2-2-0) for passenger trains (and 0-4-0 for goods).

(*To be continued.*)

AN OLD AUSTRALIAN LOCOMOTIVE.



4-4-0 LOCOMOTIVE, NEW SOUTH WALES GOVERNMENT RAILWAYS.

Built in 1878 by Beyer, Peacock & Co. Ltd.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications for information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 33, *Tothill Street, Westminster, London, S.W.1. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book"* (5s. *net*) *should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

Maximum Speeds.

We believe you would be justified in claiming for the Great Western Railway Paddington-Birmingham service higher maximum speeds than are attained on any other express service in the world, as a regular everyday practice by almost every train. The extremely fast timings of the French Northern Railway are maintained more by very rapid uphill work than by exceptional downhill speeds. The legal French speed limit is 120 km. per hour (roughly 75 miles), and this is seldom exceeded, maxima of 80 m.p.h. or over being very rare. The night boat train from Paris to Calais is the slowest, and not the fastest, train on the Nord boat services; the fastest trains of that railway are those run in a northerly direction from Paris, towards St. Quentin and Lille.

[Reply to S. P. THOMAS.]

High Voltage Electric Traction.

Mr. L. C. Roberts mentions that on the Michigan Central Railroad, U.S.A., direct current at 2,400 volts is supplied by means of top-contact conductor rails. In France direct current at 1,500 volts is supplied both by overhead wires and conductor rails. Mr. Roberts further remarks: "Apparently with a direct-current pressure of 1,500 volts it is a questionable point whether the overhead or conductor rail system is the most advantageous. One objection to employing high voltages on conductor rails, viz., the extra protection necessary, is met by the 'under-contact' design, which has been developed in recent years for use with pressures up to 2,400 volts; consequently, conductor rail distribution at 2,400 volts is practicable."

[Further reply to K. H. S. MASSEY.]

"Direct" Motion.

In a large number of locomotives fitted with Joy's valve-gear, especially on the late London and North Western Railway, the valve-motion is partly derived from a link attached to the centre of the connecting-rod. As this connection has been proved to have caused certain recent failures of connecting-rods when the engines have been running at speed a number of 4-6-0 engines of the "Prince of Wales" class have recently been rebuilt with external valve-gear of the Walschaert type, derived directly from the leading pair of driving wheels; hence the name, "direct" motion. The L.M.S. locomotive exhibited by Messrs. Beardmore at Wembley was of this type.

[Reply to JOHN F. PEARSON.]

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Tractive Effort.

Tractive force formula for simple locomotives is :—

$$T \text{ (Tractive Effort)} = \frac{d^2 \times s \times p}{D}$$

where d = diameter of cylinders, s = stroke, and D = diameter of driving wheels (all in inches), while p = working pressure in lb. per square inch. It is customary to take the effective pressure as 85 per cent. of the actual working pressure. Tractive effort is a measure of the maximum power that may be developed at the rail, but takes no account of the capacity of the boiler to raise steam.

[Reply to W. G. W.]

Junctions at Huntingdon.

Presumably the connections between the Joint line and Great Northern stations are used more or less frequently for interchange goods and occasionally other traffic, though we cannot recall that any use has ever been made of them for publicly booked services. It would be an obvious development to provide connections between stations so close together, even if only used very occasionally. Further, the interest of the late Great Northern Company in the Joint line would provide an additional reason therefor.

[Reply to "BATHONIAN."]

The Brake Problem and Grouping.

On some railways vehicles hitherto belonging to a Westinghouse brake section are being fitted with the vacuum brake to enable them to work in conjunction with coaches belonging to a vacuum section, and *vice versa*. Most railways had, too, a number of vehicles fitted with both brakes. Unless this is done, obviously Westinghouse-fitted stock cannot be used with vacuum stock, though, of course, complete sets of Westinghouse vehicles, if worked by an appropriately fitted engine, can run on a vacuum line.

[Reply to F. G. TYACK.]

Midland Scottish Train Services, L.M.S.

The remark included in our previous reply as to new compound engines working at present over the Midland Division was intended to apply more particularly to conditions at Carlisle. In fact, we have already referred to a number of instances of these engines working trains on various services from Euston, such as those between Euston and Manchester, Liverpool and Birmingham. Several readers have written in regard to the latter point, which, of course, modifies our previous reply to that extent.

[Further reply to "RADLETTIAN."]

Taper Boilers.

Boilers tapering out towards the fire-box are in use not only on the Great Western Railway but also on the London and North Eastern (the G.N. "Pacifics"), and Southern (S.E. and C. 2-6-0 and L.S.W. 4-6-0) Railways' engines. The taper, which is on top only, affords additional space for the collection of steam in that part of the barrel where the major part of the steam is produced, *i.e.*, near the fire-box. Your question in regard to speed was answered in the November issue.

[Reply to J. P. A. GRAVES.]

Locomotives at the B.E.E.

The locomotives exhibited at the British Empire Exhibition were brought into the building by means of the railway tracks laid here and there about the grounds and connected with the L.N.E.R. line. Crane power was then used to place them in their final positions. Similar methods were, of course, adopted for removal. Once on the London and North Eastern Railway, several routes were, of course, available for returning them to their respective sheds.

[Reply to H. F. M.]

Locomotive Illustrations.

One of the weak points of popular illustration is that, while full attention is given to persons or animals included, it is apparently thought sufficient to indicate a locomotive or train or, indeed, anything to do with the railway, in the crudest, sketchiest and most unrecognisable form. Insofar as the illustration you send is identifiable with an actual locomotive, it appears to suggest one belonging to the late London and North Western Railway.

[Reply to C. R. J.]

G.W.R. Locomotives.

Several readers point out that the name *Viscount Churchill* was previously borne by two-cylinder 4-6-0 engine No. 2975, which now bears the name *Sir Ernest Palmer*, taken from 4-4-0 engine No. 3368. This information was, in fact, given on page 334 of the April, 1924, RAILWAY

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MAGAZINE. We were, no doubt, thinking of the latter engine when writing our previous reply, overlooking No. 2975 as the connecting link.

[Further reply to E. B.]

Metropolitan and Great Western Joint Stock.

The Hammersmith and City Railway is jointly worked by the Great Western and Metropolitan Railways, for which reason the trains working thereon are provided jointly by the two companies, though in design they correspond to Metropolitan practice, and the trains are necessarily worked through on to the Metropolitan line to Aldgate or *via* the East London Railway to New Cross.

[Reply to "SOUTHERN E."]

Blue Discs.

By "signals" we take it that you refer to the green engine head discs on the Great Eastern section of the L.N.E.R., which are in course of being changed to blue, in order to avoid the confusion of green headlights at night—which are similarly being changed to blue—with the green of signal lamps. Please note we do not undertake to reply to more than two queries from one correspondent in any one issue.

[Reply to "FINNINGHAM."]

High Speed on the L.N.E.R.

It is quite possible that one of the L.N.E.R. "Pacific" engines is capable of developing a speed of 89 m.p.h., but such a speed would certainly not be attained on the level stretch between Biggleswade and Sandy, as reported in the newspapers. The only likely locations would be between Three Counties and Arlesey, on the down journey, or between Little Bytham and Essendine, on the up.

[Reply to R. D. KENNEDY.]

Pullman Race Trains.

You are in error in supposing that three Pullman race trains were run in one day from King's Cross to Newmarket. There is only one such train at each meeting, the other special trains being composed of ordinary corridor first and third-class stock. The Pullman stock for these trains is generally borrowed from the reserve boat train cars in use on the Southern Railway.

[Reply to "PULLMAN."]

Longest Runs.

Boat train journeys from Victoria to Dover Marine *viâ* Tonbridge were given as the longest runs over the S.E. and C. section of the Southern Railway, in view of the fact that the runs *viâ* Maidstone mentioned by you can only be described as irregular, and not even on definite days in each week, whereas the run actually shown in the Summer Service tables is made daily.

[Reply to J. F. GREENWOOD.]

Midland–L. and Y. Through Services.

Midland trains for (Manchester) Victoria leave the Midland main line at New Mills South Junction and pass through New Mills and over the Midland and G.C. Joint Line down to Ashburys, on the G.C. main line, whence they immediately diverge and by a spur join the L. and Y. Stalybridge–Manchester line at Phillips Park, near Miles Platting, and 1½ miles from Victoria station.

[Reply to "FINNINGHAM."]

G.W. Trains on the Southern Railway.

Both on its own account and as successor to the Midland and South Western Junction Railway, the G.W.R. operates a number of through trains in the Southampton district, some working through to Bournemouth. Some of these trains are worked by Southern Railway locomotives, others by those of the Great Western Company, according to the particular service.

[Reply to "SOUTHERN E."

Locomotive Lists.

We have many times explained that the only locomotive lists which have been published are those of which particulars are included in our advertising pages, and applying to the late L.N.W., L.B. and S.C. and G.W. Railways. For particulars of books dealing descriptively with particular railways, see the Railway Bibliography in the "Railway Year Book."

[Reply to N. NEWTON.]

N.C.C. (Ireland) Locomotives.

From the sketch that you send it would appear that the engine in question was fitted with a cylinder on the smokebox side for operating the superheater dampers (as was frequently done in the earlier superheater engines), but that

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the cylinder has now been removed and a "patch" placed on the smoke-box side to cover the affected part.

[Reply to R. N. CLEMENTS.]

The Weston-Super-Mare Loop.

The loop line through Weston-super-Mare was sanctioned in 1875, and opened March 1, 1884. The original line to Weston was a branch, about 2 miles in length, from a station called Weston Junction. This branch, which was opened in 1843, was at one time worked as a horse tramway, and for a period closed altogether.

[Reply to "BATHONIAN."]

Signalling Problem.

Whilst it may not contravene block regulations to send "train entering section" before lowering the starting signal, obviously this is improper working. It would seem, too, that the release of the starting signal should be one of the initial movements, and therefore it is better given by the "line clear" indication.

[Reply to "ASHPAN."]

The P. and O. Bombay Express.

This train makes stops, for working purposes only, at all the stations where the regular expresses of both the Nord and P.L.M. Railways halt for water, changing engines, or examination, such as Abbeville, Laroche, Dijon, &c., as well as at both ends of the Ceinture Railway of Paris, for transfer from one line to the other.

[Reply to J. F. GREENWOOD.]

L.N.W.R. "Precedents."

No. 1527, *Raleigh*, is one of the old "Precedents," rebuilt by Mr. Webb, the date 2/88 being that of reconstruction. As, however, the reconstruction amounted almost to building of a new engine, a new works number was given, and this explains why the same date is stated for both construction and rebuilding.

[Reply to "EXPERIMENT."]

Running Sheds, G.W.R.

As explained on several occasions, particulars cannot be given as to sheds to which particular engines are attached, in that locomotives are always liable to be shifted before information can be published. We regret that we cannot give further particulars as to the engine running on the train mentioned.

[Reply to D. B. HART.]

Newspaper Accident Reports.

We fail to note anything needing criticism in the newspaper cutting you enclose relative to a recent accident; it is, indeed, fairly accurate in its details. We agree with you, however, that newspapers rarely command much confidence in any details that they give in regard to railways, accidents not excepted.

[Reply to B. H. HARTUP.]

Southern Railway Locomotives (S.E. Section).

To our knowledge only two 4-4-0 locomotives of this section were equipped with superheaters prior to the general rebuilding policy instituted by Mr. Maunsell —Nos. 36 and 175. We have not space in which to detail the locomotive classification of this section.

[Reply to J. A. HINES.]

Water Scoops.

Practically all tender and many tank engines belonging to the L.N.W. and L. and Y. sections of the L.M.S.R. are fitted with water scoops. As the Irish mail expresses from Euston are shown in the public time-tables, you can ascertain for yourself at which stations stops are made.

[Reply to A. H. HORROCKS.]

Slip Shunting.

You are correct in your description of what is meant by slip shunting. Speaking generally, the speed of tube trains is not more than 35 m.p.h. between stations, though occasionally that is exceeded. We are obliged for your notes as to engines working in various districts.

[Reply to J. L. THORPE.]

Re-numbered Locomotives, L.N.E.R.

The system adopted on the Great Eastern section, and to some extent elsewhere, of re-numbering in the old style without re-painting is, obviously, a temporary means of obtaining the benefit of re-numbering without waiting until the engine is due for painting.

[Reply to G. WHITEHOUSE.]

Number Head Boards.

Presumably you refer to numbers carried by divided, relief and special trains at busy periods to enable particular trains to be identified by signalmen and others. The numbers in question are those given to the trains in the weekly or special notices issued to the staff.

[Reply to L. T.]

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Three-Cylinder Locomotives.

The three-cylinder system with cranks at 120 deg. gives better balancing than either two or four-cylinder arrangements. There are, however, other considerations, so that, while there is a growing tendency to use three cylinders, other arrangements are frequently preferred.

[Reply to "FOUR-SIX-TWO."]

Paris-Orleans Electric Locomotives.

Before being shipped from the United States one of these engines was tested on the General Electric Company's test track and attained a speed of 99 m.p.h. This was, of course, an extreme performance, and such a speed would not be called for in ordinary service.

[Reply to "CLAUDIAN."]

Metropolitan Railway Speeds.

Metropolitan electric locomotives are capable of speeds up to about 65 m.p.h. Rarely, however, do they have much opportunity to exceed 45–50 m.p.h., though good running is often made on the fast lines between Finchley Road and Wembley Park.

[Reply to F. G. TYACK.]

Quadruple Mileage.

To give details of the quadruple sections of the various main lines would take up far too much space, while merely to state the length would convey little substantial information, even if worked out by adding together the lengths of the various sections.

[Reply to "LOCO."]

L.M.S. Locomotives.

Ross "pop" safety-valves and Belpaire fire-boxes appear likely to figure as features in all future locomotive constructions by this railway. We have no information as to the intentions of the L.M.S. in regard to the other points you raise.

[Reply to KENNETH CLARKE.]

Dalston Junction Station.

We believe you are correct in suggesting that a station was provided at Dalston Junction when the Broad Street extension was constructed, though it may not have been on the site of the present station. We have no further information.

[Reply to H. B. BORLEY.]

Locomotive Lists.

Lists are not published in regard to the locomotives of the Great Northern and Great Eastern sections of the L.N.E.R. We have no further information in reference to Mr. J. S. MacLean's work on North Eastern locomotives.

[Reply to "CLAUDIAN."]

L.N.E.R. 4-6-2 Locomotives.

Nos. 2543-6 are similar to Nos. 1417-1481 N, except that they have shorter chimneys and altered cabs to enable them to work over the North Eastern and North British sections.

[Reply to E. W. MITCHELL AND OTHERS.]

Painting of Tank Engines, G.W.R.

Certain of the 2-4-0, 0-4-2 and 0-6-0 tank engines of this railway are painted brown, in order to harmonise with the colour of the "push-and-pull" or motor-trains, in the formation of which they are frequently employed.

[Reply to "GOLDER'S GREEN."]

N.E.R. Locomotives.

We have already explained that L.N.E.R. locomotives belonging to the North Eastern section retain their old numbers, though the numbers of locomotives belonging to other sections have been increased.

[Reply to R. W. F.]

Exceptional Speeds.

We fear we are quite unable to credit the reported speed of 120 m.p.h. to which you refer, or anything approaching it. It would be utterly impossible to accept as reliable figures obtained on the basis that you mention.

[Reply to R. O. HOLT.]

The Midland Direct Bradford Line.

This scheme for continuing the Royston-Thornhill line on independently into Bradford, to afford the Midland a new main line to the North *viâ* Bradford, has now been definitely abandoned.

[Reply to "FINNINGHAM."]

G.C. Two-Cylinder 4-6-0 Engines, L.N.E.R.

Mr. P. R. Wallis points out that engines of the "Sir Sam Fay" class, though originally built with cylinders 21 in. diameter, have now nearly all been rebuilt with cylinders 20 in. diameter.

[Further reply to K. C. DAVIS.]

Bishop's Stortford.

Distance from Liverpool Street, *via* Clapton, is 30 miles 30 chains.

[Reply to R. F. KEMBALL.]

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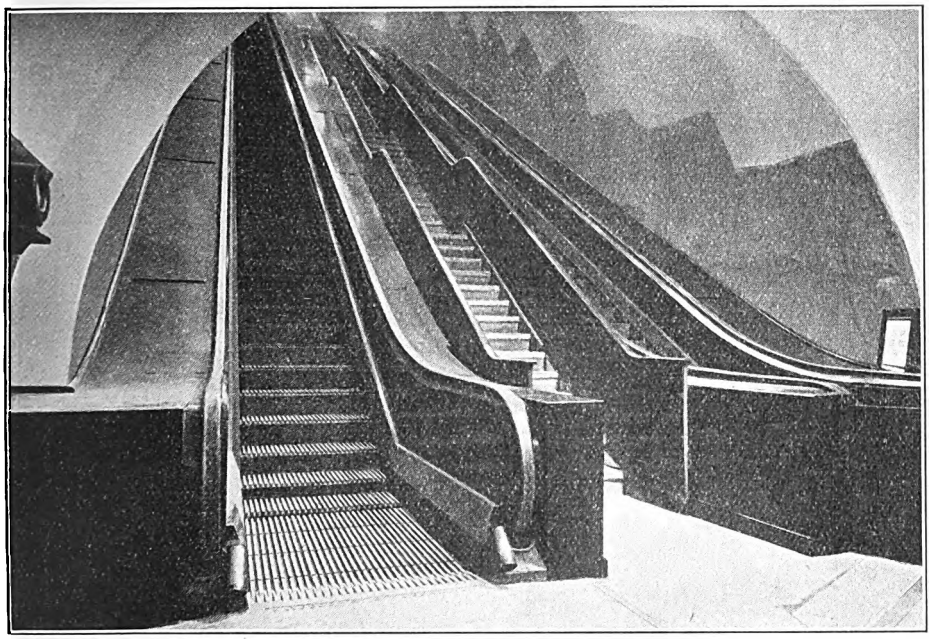

COMB TYPE ESCALATOR AT CLAPHAM COMMON.

The "City" Railway.

THE NEW CITY AND SOUTH LONDON.

ON Monday, December 1, at 11.30 a.m., a special train was run from Moorgate to Clapham Common, thus inaugurating the restoration of public train services over this section of the old City and South London (now to be known as the "City") Railway. The passengers included directors and officers of the associated "Underground" companies, representatives of other lines, Members of Parliament, mayors of several London boroughs, officers of the Ministry of Transport, and others, who were thus given the honour of making an inaugural trip before the line was opened for general traffic an hour later. To celebrate the occasion, the Hon. Marian Stanley, daughter of Lord Ashfield, Chairman and Managing Director of the associated "Underground" companies, had the honour of "driving" the train.

In the RAILWAY MAGAZINE for June, 1924, the reconstruction and opening for traffic of the northern portion of the City and South London Railway was described, together with the new works involved by the junctions at Camden Town. The principal features of the undertaking were then considered, while illustrations have been given of an electric locomotive and trailer car as used prior to closing down for reconstruction, together with views of the new rolling-stock now employed. A few further historical facts may, however, be given supplementing previous references. In this connection readers may also be referred to a very full historical article by Mr. H. L. Hopwood, published in the December, 1920, number.

The formal inauguration of the City and South London Railway was performed on November 4, 1890, by the late King Edward, then Prince of Wales. The opening for public traffic took place on the 18th of the following month. From the Monument (King William Street station) to Stockwell the line was about

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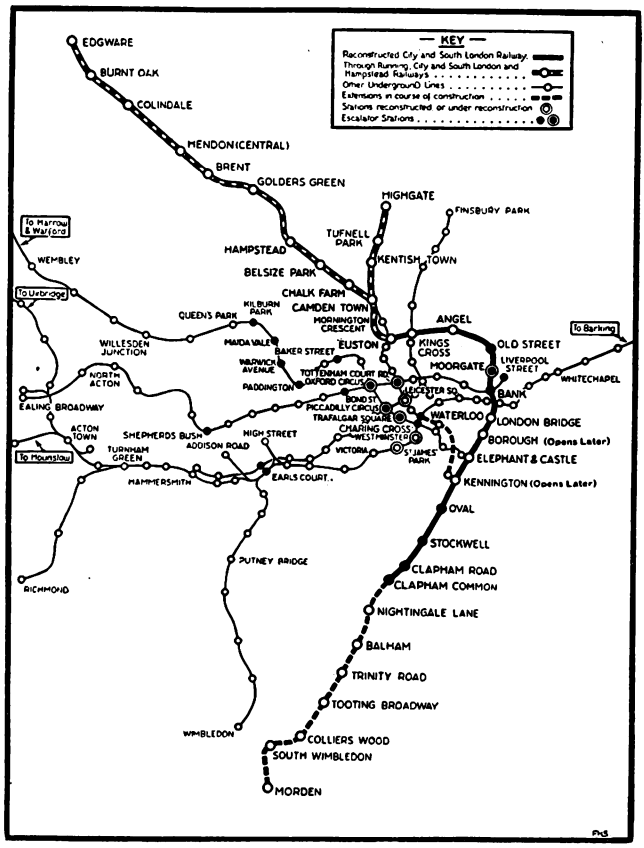

MAP SHOWING RECONSTRUCTED "CITY" RAILWAY AND CONNECTIONS.

three miles in length. There were four intermediate stations—namely, Borough, Elephant and Castle, Kennington, and Oval. Hydraulic lifts connected the booking halls of the stations with the platform levels—the domes that were architectural features of the original stations were designed to cover the lift gear.

A five-minutes' service was provided each way and the end-to-end journey occupied about 12 minutes. A fare of 2d. for any distance was charged. Passengers put down their money at a booking-office window and passed through turnstiles—pay gates, as they were termed—to the lifts. Save that the fares between certain stations were reduced to 1d. during certain hours, the 2d. fare remained in force until the extension to Moorgate was opened in 1900. During the first two weeks of operation 165,000 passengers were carried and the receipts amounted to £1,568.

The original trains were composed of three cars of tramcar type (third-class only), hauled by electric locomotives equipped with two 50-h.p. motors and notable at that time in being the first to have the armatures built directly upon the axles. The cars had no windows, and the only side openings were narrow ventilation slits below the roof. The upholstery of the interior completely covered the sides; hence the cars were promptly dubbed "padded cells" by the facetious. The conductors who opened and shut the gates advised the passengers of their whereabouts in the lower regions. Each train accommodated about 96 passengers, 32 per car. The original rolling-stock consisted of 14 locomotives (by Mather and Platt) and 30 cars. When the line was closed down for reconstruction the complement was 44 locomotives and 161 cars, 33 of the latter being all-steel. Needless to say, the windowless carriage did not remain a feature of the line.

The power house, car sheds, repair shops, &c., were established at Stockwell. An inclined road, worked by a hauling engine, connected the tunnels with the depot and enabled the rolling-stock to be brought up for repairs. This proved unsatisfactory, however, and was superseded after a time by a 20-ton hydraulic lift, working in a shaft above sidings. When the line was extended an entirely new power house was built at Stockwell, and sub-stations were erected at London Bridge and the Angel. This power house and the sub-stations remained in commission until 1915, in which year the electric supply was first taken from the "Underground" power house at Chelsea. New sub-stations were then built at Stockwell, Elephant and Castle, and Old Street.

The first addition to the original scheme was the extension to Moorgate, which was

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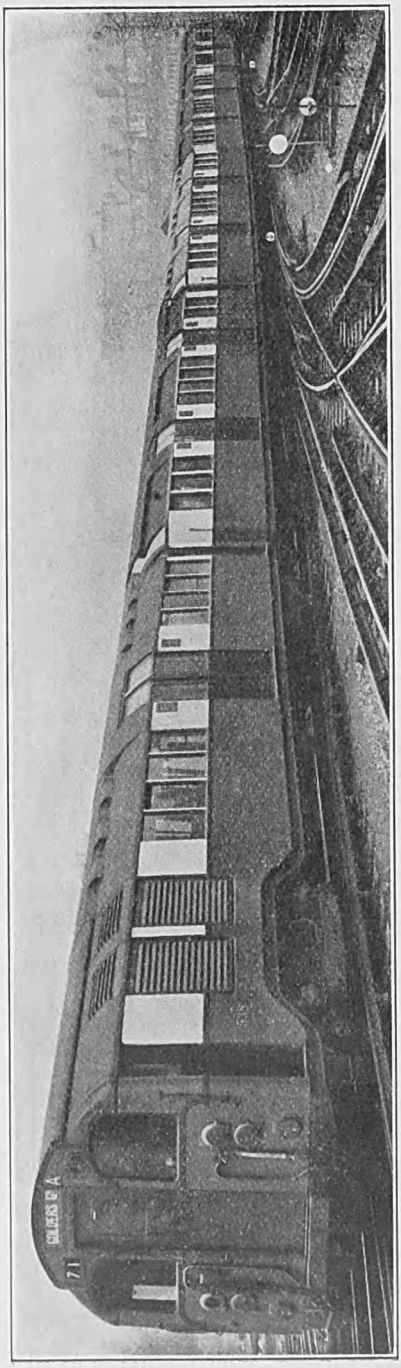
opened for traffic on February 26, 1900. This formed part of an extension to the Angel at Islington, authorised by an Act of 1893, which gave powers also for the replacement of the incommodious King William Street station by a station at the Bank and for the erection of a station near the Southwark end of London Bridge. The new line was begun from a point north of the Borough station and carried under the river west of London Bridge, in order to obtain a better approach to the City than the one afforded by the original tunnels east of the bridge. The extension from Stockwell to Clapham was opened on June 4, 1900, and the extension to Islington in November of the following year. In 1903 powers were acquired for projecting the line from the Angel to Euston. This additional section was opened on May 12, 1907. Thus the City and South London Railway attained its present length of about 7 miles.

Like many another pioneer work, the City and South London Railway had certain peculiarities of design that militated against the adoption of the improvements introduced on the "tubes" of later date, the construction of which it had inspired, particularly in regard to the diameter of the tube sections. At certain stations the running tunnels converged into a single tunnel of large diameter, and the trains drew up at an island platform; but the station tunnels of the old line were roughly only about 200 ft. long, quite insufficient to accommodate the modern seven-car "tube" train. On the original section of the line the station tunnels were constructed in brickwork, another unusual feature.

The following figures show the development of the traffic :—

	Passengers.
1891 (first complete year of operation)	5,363,000
1899 (last year of working King William Street and Stockwell section only)	7,269,000
1901 (Clapham and Moorgate Extensions working)	13,413,000
1902 (Angel Extension working)	19,783,000
1908 (Euston Extension working)	22,732,000
1913	22,724,000
1921 (last complete year in which the whole line was in operation) ..	31,827,000

During the 33 years that the old City and South London Railway was in operation—from December 18, 1890, to November 27, 1923—it carried a grand total of over 660,000,000 passengers. At



MODERN MULTIPLE-UNIT TRAIN AS NOW USED ON THE CITY AND SOUTH LONDON RAILWAY.

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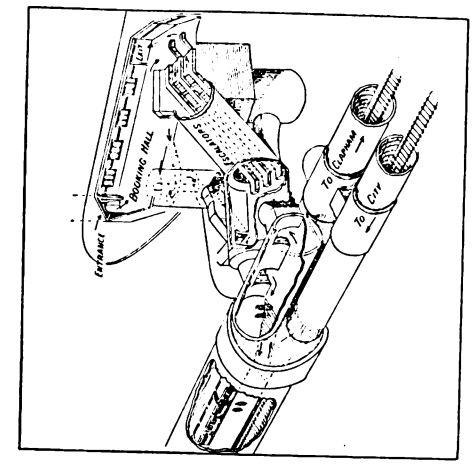
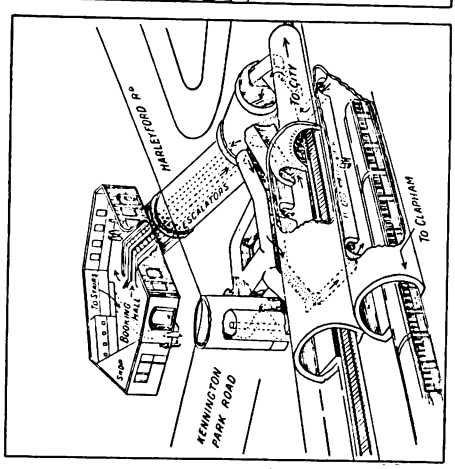
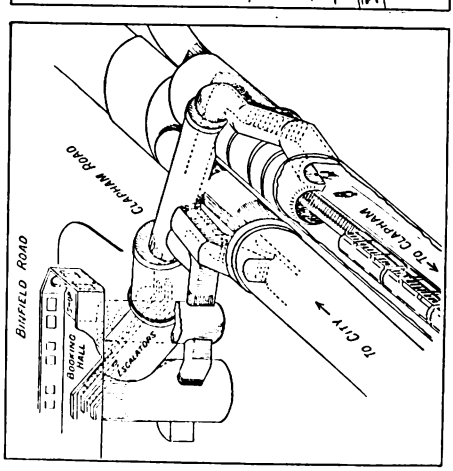
the beginning the company laboured under a not unusual corollary of enterprise—it paid no dividend on the ordinary stock for the first complete year of operation; and for the next two or three years paid only a very small one. In 1902, after the opening of the Angel and Clapham extensions, 3¼ per cent. was paid.



Clapham Road.



Oval.



Stockwell.

ARRANGEMENT OF TUBES, ESCALATORS, &c., AT STATIONS MENTIONED.

The City and South London Railway became amalgamated with the "Underground" group of companies in January, 1913. In the same year powers were acquired for the entire reconstruction of the line and also for effecting a junction between it and the Hampstead Tube at Camden Town.

Reconstruction was begun on August 9, 1922. The northern section of the line—between Moorgate and Euston—was closed down entirely in order that, by working day and night, the completion of this section might coincide with the inauguration of the Camden Town Junction and the Edgware Extension. This was duly achieved, and the northern section—reconstructed and re-equipped—was restored to operation on April 20, 1924. Work on the southern section—between Moorgate and Clapham Common—was begun on August 9, 1922; but until November 27, 1923, it proceeded at night only, train services being maintained till 8 p.m. On the latter date the train services were withdrawn, and the resultant speeding up of the task in hand has enabled the City and South London Railway as a whole to be opened for traffic—virtually a new line—by December 1, 1924.

Reconstruction methods were very fully dealt with in our previous article, so that there is no need to repeat that information here. The amount of employment provided by the reconstruction and re-equipment of the line has been very considerable. During the height of the operations well over 2,000 men were working on the line at one time; and from first to last the volume of employment engendered directly and indirectly has been equivalent to 5,500 men being employed continuously for a period of two and a-half years. All the materials and plant used were of British manufacture, and in their desire to use only British products, the "Underground" engineers were instrumental in developing in this country the manufacture of certain special tools, &c., that were previously obtainable only abroad.

The general effect of the reconstruction and re-equipment of the City and South London Railway has been to transform the oldest tube of the "Underground"

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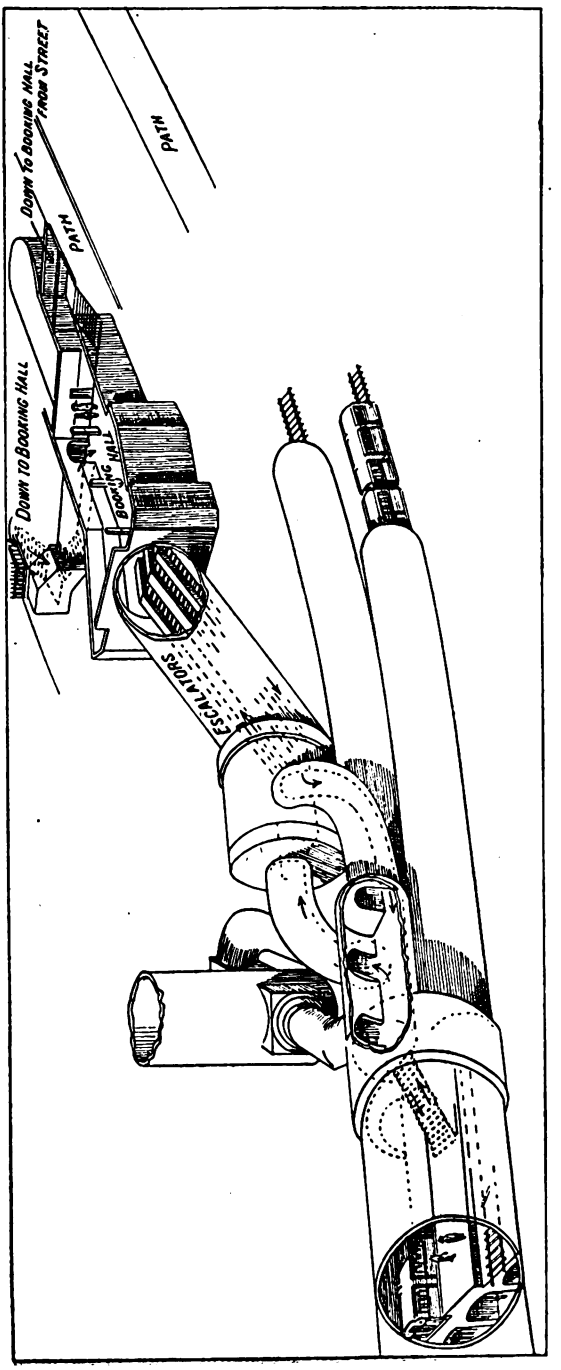
into the most modern line of the system. When the works in hand are completed in their entirety, the line will, indeed, in some respects reflect an advance on the other "tubes." As the first underground railway of any sort in South London, it provided to the small area it then served a readier means of access to the City than had hitherto obtained, and eventually linked up South London with Islington and Euston. It now affords a greatly improved service, not only between South London and the City, and Islington and Euston, but between South London and Camden Town, Kentish Town, Highgate, Hampstead, Golders Green, Hendon and Edgware. A year or so hence the extension through Balham and Tooting to Merton and Morden will be opened; and about the same time the connection at Kennington with the Hampstead Tube will be inaugurated. Facilities for rapid transit in South London will then undergo another material improvement.

Some little time has yet to elapse before all the stations will be finished. Thus, at Old Street station the old premises are being utilised pending the completion of the escalator installation and other works. The new station at Moorgate, with escalators, was placed in service a few months ago. The Angel and other stations on this section have been considerably improved. Throughout the line the station tunnels have been retiled.

On the southern section entirely new stations have been constructed at Clapham Common and Stockwell; Elephant and Castle, Borough and Oval stations are being rebuilt; and Clapham Road is undergoing an extensive remodelling. At the last-named and at Oval, escalators will be a feature. London Bridge station has been redecorated and improved in other ways. At Kennington work is in hand in connection with the loop extension to this point of the Hampstead Tube. Kennington and Borough stations will not be reopened until later.

The new Clapham Common station has been formed beneath the main highway



LAY-OUT AT CLAPHAM COMMON STATION

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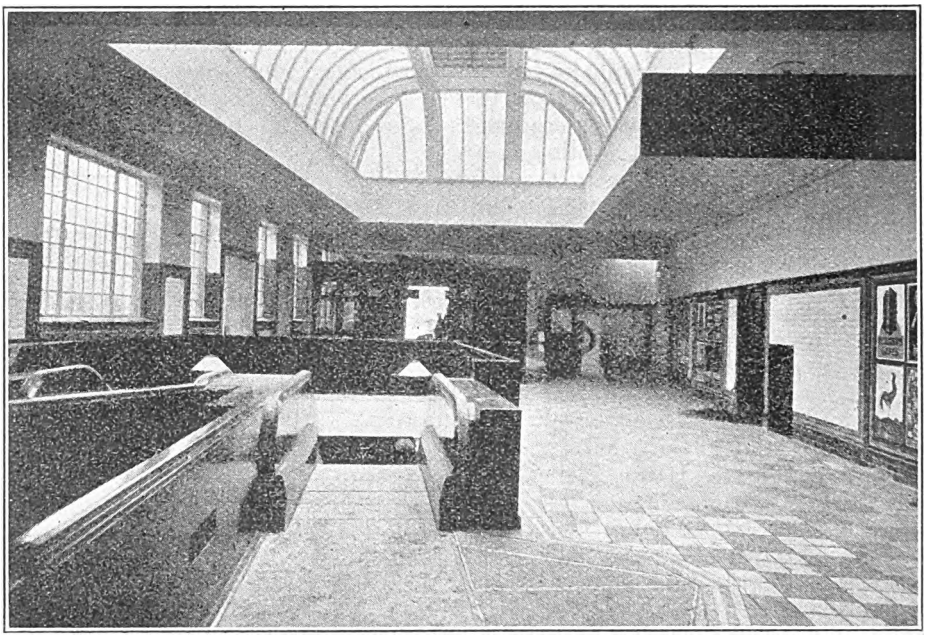

BOOKING HALL AND HEAD OF ESCALATORS, STOCKWELL.

—an arrangement that will be adopted at several of the stations on the Morden Extension—with the advantage that the booking hall is directly over the running tunnel. There are thus two entrances. In one case the superstructure is a sort of kiosk, in terra-cotta; in the other merely a low surround, of the same material, with glazed canopy, enclosing the head of the stairs. These entrances are connected by a passageway, which will be available for use by the general public crossing the road. Two escalators, working on each side of a fixed staircase, connect the booking hall with the island platform, the ascending escalator being of the new cleat-comb type—the first in England. The chief feature of improvement is the elimination of the shunt, or flat-moving sections, at head and foot, which enables the passenger to step off with a forward movement and—although this does not apply at Clapham—makes for economy of space, an important consideration in the lower levels of an underground station. In constructing the new station, the Underground Company built new public lavatories and effected other improvements above ground.

The new Stockwell station reflects the general line of the type of station that will replace others of the original line. The exterior is of cream-coloured terra-cotta, with black dressings. The booking hall, like that at Clapham Common, is similar in general character to the one recently provided at Westminster (Metropolitan District Railway). New platform tunnels of standard design have been constructed, and the old 30-ft. tunnel into which the "up" and "down" tracks previously converged has been converted into a siding.

The tunnels being closed at both extremities and no special measures being in force to ensure proper ventilation, the old City and South London Railway had rather a bad reputation for "stuffiness." This defect has been remedied to a large extent by the mere process of reconstructing the line. But to ensure that the new line shall be one of the best ventilated of "tube" railways, special pressure plants have been installed at most stations.

Entirely new track equipment, of London Electric Railway standard, has been installed. The new signalling embodies the latest features of "tube" practice. On the northern section, cabins for operating signals and points are provided at Euston, Angel, and Moorgate; on the

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southern section at London Bridge, Stockwell, and Clapham Common. Normally, the London Bridge and Stockwell cabins are closed, the locking frames here having "King" levers. "King" levers are likewise fitted to the locking frames at Euston, Angel and Moorgate. Clapham Common being a terminal station, the cabin here is open continuously. Locking frames in all cabins are for power working, and have miniature signal levers; and the cabins are furnished with illuminated diagrams. All signals are electrically controlled, and are fitted with train stops, the latter, like the points, being operated by compressed air.

The new all-steel cars have already been fully described.

Between Clapham Common and Camden Town there are now 26 trains per hour in each direction. Half of this service works between Camden Town and Golders Green, Hendon, and Edgware; and half between Camden Town and Highgate. During the busier periods of the day there are through services between Clapham Common and Edgware; at other times the through trains work between Clapham Common and Golders Green and Highgate. Non-stop trains are a feature.

In many instances the fares are less than those in force at the time the old line was closed down. Thus, from Clapham Common to the Elephant and Castle is 2d., and to London Bridge 3d. From Stockwell to Moorgate 3d., and to Angel 4d.; from Oval to King's Cross 4d. From Clapham Common to Edgware ($16\frac{1}{4}$ miles) the fare is 10d., and the journey time 52 min.; to Hampstead, Golders Green and Highgate the fare is 7d. For long-distance journeys zone fares are in force; thus, the fares from Stockwell to Edgware, Golders Green and Highgate, respectively, are the same as those from Clapham Common. In addition, certain through fares to stations on other "Underground" lines show a reduction of 1d. Season-ticket rates have also been reduced, while reduction in combined rail and motor-bus season tickets, between Clapham Junction, Balham, Tooting, Mitcham and Merton and the City and West End areas, respectively, are issued.

RAILWAY LITERATURE.

BULLETIN No. 8, RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY. The high standard realised in previous issues of this Bulletin is well maintained by No. 8, which includes a large number of interesting articles, freely illustrated by drawings, &c., many from historical material. In connection with an article upon the work of Matthias W. Baldwin, founder of the Baldwin Locomotive Works, a detailed list is given of the first 100 locomotives built by him up to 1838. Another article deals with United States locomotive shops in 1855, while further items include a railway history of the Province of New Brunswick; an article on early engineering on the Houston and Texas Central Railroad; contributions by Mr. G. W. Bishop, of British interest in view of the forthcoming railway centenary; "Recollections of the New York and Boston Express Line"; and a review of the engines of the Old Colony Railroad. For further particulars as to the Society, readers may be referred to the British representative, Mr. G. W. Bishop, 57, Warwick Road, Kenilworth.

MESSRS. BASSETT LOWKE LTD. send their new railway catalogue Section "A," copies of which can be had, price 1s., from the head offices at Kingswell Street, Northampton, or from the London or Edinburgh branches, as given in their advertisement in this issue. A novel note is struck by an introductory section, the text of which is printed in red. Included in this is a short article entitled "The Fascination of the Railway," and sections relating to the influence of grouping upon their railway models. The special lines this season are: electric table railways; special train sets; new L.N.E.R. 4–4–0 model; "Peckett" saddle tank engine in gauge I as well as gauge O; L.M.S. 4–6–0 "Prince of Wales" type; G.W.R. 4–6–0, *Titley Court;* S.R. 4–6–0 "736" type; L.M.S. goods brake van; L.N.E.R. coaches; L.M.S. dining car; mail apparatus for P.O. vans; and an enlarged selection of railway accessories of various kinds. Particulars are also given of a new series of drawings by Mr. Henry Greenly, while the catalogue as a whole sets forth an all-round reduction in prices over last year.

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THE RAILWAY PORTRAIT GALLERY.

Photo.] **MR. M. F. KEOGH,** [*Lafayette.*

General Manager,
Great Southern Railway, Ireland.

MR. M. F. KEOGH, who has been appointed General Manager of the new Great Southern Railway, Ireland, succeeded Mr. Joseph Tatlow as General Manager of the Midland Great Western Railway in January, 1913. After experience in London as a Parliamentary Agent, Mr. Keogh returned to Ireland in 1898 to take up the position of Secretary to the Dublin, Wicklow & Wexford Railway (now Dublin & South Eastern), holding this office for 14 years.

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The Great Southern Railway, Ireland.

The Railways (Great Southern) Preliminary Amalgamation Scheme, 1924, covering the amalgamation of the Great Southern and Western, Midland Great Western and Cork, Bandon and South Coast Railways, received the approval of the Railway Tribunal of the Irish Free State on November 12, 1924. The following constitute the board of the new company :—

* The Rt. Hon. Sir William J. Goulding, Bart., P.C., D.L., Chairman, Luttrelstown, Clonsilla, Co. Dublin.
† Sir Walter R. Nugent, Bart., Deputy-Chairman, Donore, Multyfarnham, Co. Westmeath.
* Major H. A. Henry, Deputy-Chairman, Keadeen, Newbridge, Co. Kildare.
† Mr. Patrick J. Brady, Glena, Booterstown, Co. Dublin.
* Major T. A. E. Cairnes, The Glen, Drogheda.
* Mr. C. D. Evans, St. Helens, Lucan, Co. Dublin.
* Sir Henry J. Forde, The Manor of St. John's, Waterford.
* Mr. James P. Goodbody, Summerville, Limerick.
† Mr. Arthur Jackson, Lisroyan, Sligo.
* The Rt. Hon. The Earl of Kenmare, C.V.O., Kenmare House, Killarney.
*‡Mr. A. R. MacMullen, Oriel House, Ballincollig, Co. Cork.
*‡Dr. W. Lombard Murphy, Dartry, Upper Rathmines, Dublin.
* Mr. Joseph X. Murphy, Ashurst, Merrion Avenue, Blackrock, Co. Dublin.
† Mr. Joseph Tatlow, Kalafat, Dalkey, Co. Dublin.

The following are the officers of the new company :—

General Manager ...	M. F. Keogh.†
General Manager's Assistant ...	G. E. Smyth.*
Secretary	C. E. Riley.*
Solicitor	E. White.*
Assistant Solicitor	F. de V. White.†
Accountant ...	F. H. H. Smith.*
Commercial Manager	T. Elliott.†
Operating Superintendent	P. J. Floyd.*
Chief Engineer ...	J. F. Sides.*
Deputy Chief Engineer	A. W. Bretland†
Chief Mechanical Engineer	J. R. Bazin.*
Deputy Chief Mechanical Engineer ...	W. H. Morton.†
Stores Superintendent	F. G. Prideaux.*
Audit Accountant ...	Wm. Smyth.†
Hotels Manager ...	S. J. Medcalf.*
Chief Transfer Officer	B. Hudson.*
Chief Cashier ...	C. H. Blackham.*
Paymaster	R. Carley.*

* Great Southern and Western. † Midland Great Western. ‡ Cork, Bandon and South Coast.

Mr. George Edward Smyth, O.B.E., who has been appointed General Manager's Assistant, Great Southern Railway (Ireland), has held the office of Traffic Manager to the Great Southern and Western Railway Company since November, 1919. He had already been Superintendent of the Line to the same company since 1911, prior to which date he was Chief Assistant to the Goods Manager and Traffic Manager. Mr. Smyth entered the service of the Great Southern and Western Railway of Ireland in the 'seventies as a Clerk in the office of the Traffic Manager. After two years indoors he was engaged in outside duties, learning station and traffic work. In 1887 he became Cashier in the Goods Department in Dublin, and two years later was Accountant and Chief Clerk. In 1892 he was Chief Assistant to the Goods Manager, and in 1894 he transferred to a like post under the Traffic Manager. For seven years Mr. Smyth was Chief Assistant to the General Manager. During this period, among other special duties, he was engaged in the preparation of the Irish Railway Companies' case for the Vice-Regal Commission on Irish Railways, entailing an absence of nearly two years from the Great Southern and Western duties proper. Throughout his official career Mr. Smyth has been a familiar figure at Clearing House meetings, both in London and Dublin. In 1920 he was unanimously elected Chairman of the Traffic Officers' Committee of the Irish Railway Clearing House.

Mr. John F. Sides, B.E., M.Inst.,C.E., M.Inst.C.E.I., who has been appointed Chief Engineer to the Great Southern Railway (Ireland), previously occupied the position of Chief Engineer to the Great Southern and Western Railway Company, to which he was appointed in 1921. Mr. Sides

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MR. G. E. SMYTH,

General Manager's Assistant,
Great Southern Railway (Ireland),

MR. J. F. SIDES,

Appointed Chief Engineer,
Great Southern Railway (Ireland).

[*Lafayette.*

MR. J. R. BAZIN,

Appointed Chief Mechanical Engineer,
Great Southern Railway (Ireland).

MR. W. H. MORTON,

Appointed Deputy Chief Mechanical Engineer,
Great Southern Railway (Ireland).

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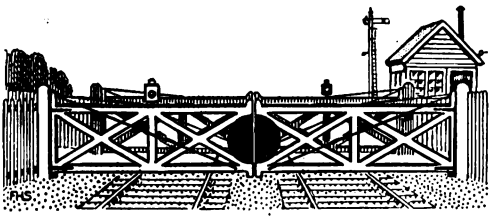
received his technical education at Queen's College, Belfast, and in 1895 took his degree in Engineering at the Royal University of Ireland, gaining first place and first-class honours in the final examination. During 1895–96 he was a pupil of the late Mr. A. McC. Stewart in Londonderry, and during 1896–1900 was engaged on various new railway works, particularly those of the Fishguard and Rosslare Railways and Harbours undertaking. From 1900 to 1904 Mr. Sides was engaged as Assistant Engineer to the Great Southern and Western Railway, under Mr. A. Gordon, and from 1904 to 1920 held the position of District Engineer in charge of the Northern District of the same railway. On the retirement of Mr. Gordon on January 1, 1921, Mr. Sides became Chief Engineer to the Great Southern and Western Railway Company.

Mr. J. R. Bazin, who has been appointed Chief Mechanical Engineer to the Great Southern Railway (Ireland), became Chief Mechanical Engineer to the Great Southern and Western Railway of Ireland, in succession to the late Mr. E. A. Watson, in November, 1921. Mr. Bazin was educated at Berkhamsted, and in September, 1897, entered Doncaster Works, Great Northern Railway, as a premium apprentice. After being engaged for three years on shop work, he was transferred to the running department, where he spent a considerable time attached to running sheds and firing on locomotives. He was then appointed an Acting Inspector in the Locomotive Running Department until March, 1905, when he became Assistant to the London District Locomotive Superintendent in charge of Hornsey shed. In August of the same year he was appointed Assistant District Locomotive Superintendent at Colwick, Nottingham, in September, 1906, being transferred to a corresponding appointment at Peterborough. In May, 1908, Mr. Bazin was appointed Assistant Works Manager at Doncaster, and in March, 1916, became Acting Carriage and Wagon Superintendent. In May, 1919, he joined the Great Southern and Western Railway as Works Manager at Inchicore.

Mr. W. H. Morton, M.I.Mech.E., who has been appointed Deputy Chief Mechanical Engineer, Great Southern Railway (Ireland), served his apprenticeship with Kitson & Co., the well-known locomotive builders of Leeds, and received a comprehensive technical training at Leeds University and Leeds School of Science and Technology, where he qualified as Honours man in Engineering Design. On completion of his apprenticeship, Mr. Morton was employed by Kitson & Co. as a leading draughtsman, and later as Assistant Works Manager. In 1914 he was elected a member of the Institution of Mechanical Engineers. Since joining the staff of the Midland Great Western Railway of Ireland, Mr. Morton has successively filled the posts of Chief Draughtsman, Works Manager, Assistant Locomotive Engineer and Chief Mechanical Engineer, and now becomes Deputy Chief Mechanical Engineer of the new group of Irish railways. Mr. Morton has had nine years' service as Chief Mechanical Engineer to the Midland Great Western, having been appointed to that position in 1915.



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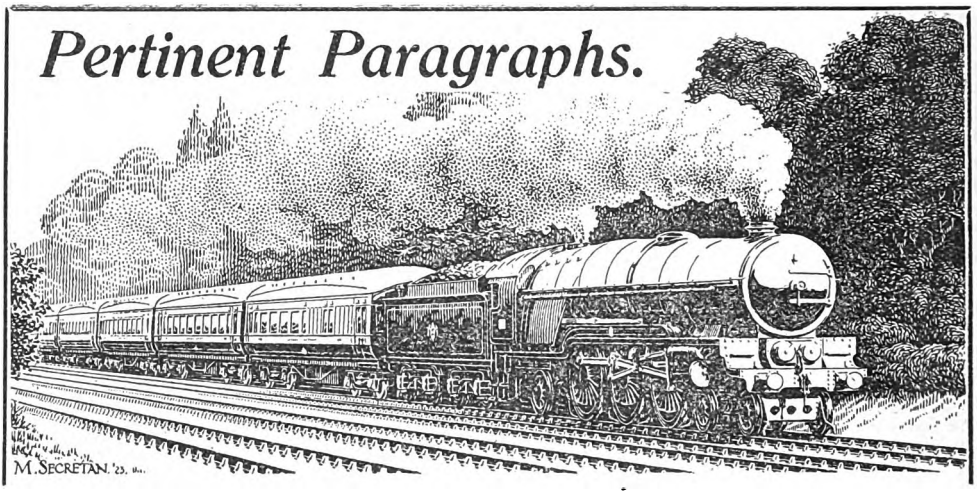
Pertinent Paragraphs.



Railway Bills in Parliament.

CONSIDERABLE new railway construction is contemplated in the Bills which are being promoted for the coming Session, although the Nottingham and Retford scheme of the London and North Eastern Railway and the Mid-Nottinghamshire lines of the London Midland and Scottish Railway are to a large extent competitive. Each of these companies is, in addition, promoting new colliery branches, and the London & North Eastern is making a fresh attempt to provide new facilities for the Scunthorpe iron and steel works traffic. Its General Powers Bill also provides for an important widening at the western end of Fenchurch Street station. Among the new works in the Southern Railway Bill are widenings of the South Eastern and Chatham main line as between Kent House and Beckenham Junction, and the construction of a funicular railway at Ventnor. The most interesting proposal, however, in this Bill is that relating to the acquisition of the East London Railway, which confirms the persistent rumours as to the future of that undertaking. All three of the big companies who are now promoting Bills are asking for additional capital powers, and for some variation of their liability under Section 46 of the Railways Clauses Consolidation Act, 1845, to maintain road surfaces on bridges over and approaches to their intended railways. The London Midland and Scottish Railway and the London and North Eastern Railway Bills contain proposals as to Scottish trusts, and the London and North Eastern and Southern Companies are asking that stock transfers need no longer be under seal. Another interesting item is the proposed transfer of the Ballycastle Railway to the London Midland and Scottish Company. No Bills are being promoted for next Session by the Great Western, the Metropolitan, or any of the "Underground" Railway Companies. In the Provisional Order promoted by the Glasgow Corporation there is a proposal to remove the present subway station building in St. Enoch Square, and to construct two new approaches to that station from the London Midland and Scottish St. Enoch station.

East London Railway.

AFTER an existence of a little over 50 years, the East London Railway, if Parliament allows, will next year become the property of the Southern Railway Company. This very useful link between railways north and south of the Thames has never yet had the success it deserved, and during the period of Government control it was actually penalised by its own enterprise. The line was electrified in March, 1913, and the passenger traffic soon began to expand, but the benefits of the expansion were from 1914 to 1921 enjoyed wholly by the Government, which allowed the company during that time only its minimum rental of £30,000 a year, and left it to bear the full burden of the interest on capital spent on electrification. This injustice was to some extent remedied in 1922 by the Railways Amalgamation Tribunal's award of about £133,000 by way of compensation. From a traffic point of view perhaps the worst experience of the East London was that between the withdrawal in 1905–1906 of the Metropolitan and the District through trains when those systems were electrified, and 1913 when the East London was electrified. The first section of the East London, from New Cross to Wapping through the Thames Tunnel, was opened in December, 1869, but it was not until 1876 that the extension from Wapping to a junction with the Great Eastern near Shoreditch was completed. A very complete article describing the East London Railway was published in the RAILWAY MAGAZINE for April, 1919.

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Dublin and Kingstown Railway.

WHEN the formation of the "amalgamated company" in the Irish Free State is complete the oldest line in Ireland, the Dublin and Kingstown, will cease to have a separate existence. This railway was opened from Westland Row station, Dublin, to Kingstown on December 17, 1834, and was afterwards extended a further two miles to Dalkey, making a total length of eight miles of double line. Since 1856 it has been worked by the Dublin and South Eastern (formerly Dublin, Wicklow and Wexford) Company, and it is an essential link in the Anglo-Irish mail service *via* Holyhead and Kingstown. It also carries a heavy daily residential traffic. Under the original lease, which was made perpetual by an Act of 1865, the annual rent payable for the line by the Dublin and South Eastern Company was £36,000, out of which half-yearly dividends of at least 9 per cent. (and more frequently 9½ per cent.) per annum were paid up to February 28, 1903, on the Kingstown Company's ordinary capital, its financial half-years ending in February and August. Tramway competition along the whole route between Dublin and Dalkey began, however, so seriously to reduce the receipts on the Dublin and Kingstown line that in 1902 and 1903 the working company had to make good out of receipts from its own undertaking losses of about £17,000 a year on the Kingstown line in order to maintain the full rent. Eventually, a revision of the lease was agreed in 1905 by the two companies under which the annual rent was reduced to £30,000, the Kingstown Company being also entitled to 30 per cent. of any surplus of Kingstown line receipts over £75,000, so long as the total annual payment did not exceed £36,000. For the last ten years the Dublin and Kingstown dividends have varied between 7¾ and 8 per cent., and the residential traffic is flourishing in spite of the tramway competition.

New Rolling-Stock for "Thanet" Services, S.R.

THE inaugural run of a new train of corridor vehicles, composed of Pullman and first and third-class vehicles, which has recently been placed in the London and Thanet service of the Southern Railway, took place on November 17. This is the first time that such a train has been provided between these points. The coaches are of metal construction and are steam-heated and electrically illuminated. The first-class compartments have, in addition to the usual ceiling lights, lamps in each corner, which can be switched on and off as passengers desire. Bell pushes are provided in all compartments for summoning waiters, and fittings have also been arranged enabling tables to be fixed for serving luncheons, dinners, teas or other refreshments.

The dimensions of the carriages are:—Length, 60 ft.; width, 8 ft. 11½ in.; height, 10 ft., the weight (empty) of the complete train being 285 tons, and includes a first-class Pullman car in addition to the eight bogie carriages. This train leaves Ramsgate at 8.45 a.m. each weekday, calling at Broadstairs and Margate, and is due at Victoria at 10.40 a.m. The return trip leaves Victoria at 7.0 p.m., calling at Whitstable, Herne Bay, Birchington, Broadstairs, Margate and Ramsgate. On Saturdays additional journeys are run, leaving Victoria at 11.35 a.m. and Ramsgate at 3.0 p.m.

Another train of this stock was introduced on November 20, commencing with the 3.15 p.m. service from Victoria to Ramsgate Harbour. The corresponding up service is the 10.0 a.m. from Ramsgate Harbour to Victoria.

L.N.E.R. Train Alterations.

A NUMBER of alterations took place in London and North Eastern Railway train services commencing December 1. The most important concern the London and Mansfield service on the Great Central Section. The 5.0 p.m. from Marylebone has reverted to the timing in force prior to July 14, and again reaches Nottingham at 7.26 (instead of 7.44). The restaurant car continues to go through to Mansfield, being due there at 8.7 p.m., instead of 8.23. Prior to July 14, the restaurant car on this train worked through to Sheffield. The restaurant car, which since July 14 had been running from Mansfield on the 7.5 a.m. train to Marylebone, has from December 1 been attached to the more convenient 8.0 a.m. train, which until then had been merely a train to Leicester. From December 1, the 8.0 a.m. from Mansfield has been continued through to Marylebone, arriving there at 11.0 a.m., as the Mansfield coach did when attached at Nottingham to the up Sheffield express prior to July 14 last. As a complement of the improvements, the 4.30 p.m. Marylebone to Woodford and Hinton has been reinstated, and is continued to Leicester, taking up thence to Nottingham the time of the 7.18 p.m. In the up direction several slight alterations have been made in the morning trains between Nottingham, Leicester and London.

The 2.6 p.m. from Edinburgh (Waverley) and the 1.26 p.m. from Glasgow (Queen Street) for Aberdeen, leave at 2.15 and 1.20 p.m. respectively. The latter, instead of being joined to the Edinburgh train at Dalmeny, runs forward to Dundee (Tay

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Bridge), calling at Burntisland and Kirkcaldy and arriving, as during the summer, at 3.27. The alteration gives the Edinburgh train a non-stop run to Dundee, in 80 minutes. From Dundee to Aberdeen the present timing remains. The sleeping car service to Aberdeen on Saturday nights is now by the 10.25 p.m. from King's Cross. Since December 1 this sleeping car has terminated at Dundee on Sunday mornings as on other mornings.

Fratton-East Southsea Line, S.R.

It will be remembered that this branch, originally the joint property of the London and South Western and London, Brighton and South Coast Railways, has for many years been disused. It is now being demolished, and we are indebted to Mr. O. J. Morris for the following notes in regard thereto. The Fratton-East Southsea Joint line, 1 mile 27 chains in length, was opened July 1, 1885, closed a few days after the outbreak of war in 1914, and used, until a year or two back, as a siding for odd carriages. It started from a special island platform, south of the main platforms of Fratton-and-Southsea station. Now that the line is undergoing conversion into a first-class road out of the town, Portsmouth Town station has become "Portsmouth and Southsea," while "Fratton and Southsea" has reverted to its original appellation "Fratton." Half of Bridge No. 1, carrying Goldsmith Avenue and the tramway over the line, was first demolished; tramway communication being continued over the other half until the new road bed, with a level tramway track, was ready; the remainder of the bridge then being pulled down. On the site of the railway near Bridge No. 3 the sleepers still remained at the time Mr. Morris visited it; also the inclined way leading from the pavement to the platform, together with the timberwork of the platform itself. The fixed distant signal, erected in 1885, was also still standing, though it had not been in use since about 1903, when motor trains were introduced, using one line only, so that signals became superfluous. The old terminus, which was for many years derelict, is now let as a motor garage, though, for some time after, the railway connections, water columns, platforms, &c., remained, while the old signal box existed until quite recently. It will be remembered that the original terminus was replaced by a wooden station on a different site at the time the motor service was introduced. Mr. Morris continues: "The writer has known this line for close upon 20 years, and, until 1915, lived near it. The motors belonged to both lines, the coach section being painted 'Brighton' colour, and the locomotive section, South-Western green. Each motor—there were a couple, numbered 1 and 2—ran for a fortnight, after which it went to have the boiler washed out at Fratton sheds. Sometimes the spare one broke down at the same time; then an L.S.W. 0-4-4T would haul the protesting motor to and fro in a very undignified manner. So punctual was the running that we used to set our clocks by the passage of the noisy little beast! Fares were one penny third, and twopence second—a very secluded retreat this second, when the tramcar fare was only one penny, —and stops were made at Albert and Jessie Road halts. The journey took about 15 min., and the motion, due to the very small wheels, was highly disagreeable. I had the pleasure of becoming very well acquainted with the guard who worked the service for many years until the bitter end."

Old G.W. Tank Engines.

In further reply to the inquiry from Mr. A. H. Hastie, mentioned in "What the Railways are Doing," on page 417 of the November Railway Magazine, and remarks in regard thereto in the December number, Mr. J. G. Evans writes as follows:—"*Cader Idris* and her sister engine *Plynlymon* (both 2-4-2T's) were built by Sharp and Stewart for the Manchester and Milford Railway. This line existed only between Pencader and Aberystwyth, and has for some years been worked by the Great Western Railway. Some of the Manchester and Milford track, signals, &c., still remain in use. Both the above-mentioned engines have been consigned to the limbo of unwanted things—the scrap heap—*Plynlymon* going first. Both *Cader Idris* and *Plynlymon* were reconditioned at Carmarthen. Of *Plynlymon's* original appearance and condition I know nothing. That she had undergone some changes was obvious. Testimony in this direction was borne out by the fact that she possessed various fittings of Great Western Railway practice—to wit, the chimney and the brake ejector in connection with a crosshead worked pump. She retained a Ramsbottom safety valve having a polished brass base. Further, both *Plynlymon* and *Cader Idris* (prior to her reconditioning) carried a steam sanding gear. The former engine, as I have seen her, bore no name plate, and her number I forget. It might be recorded in the Great Western Railway book of locomotives with names and numbers. I saw *Cader Idris* before she underwent any serious change at the hands of the Great Western Railway, when she had a long chimney which bore a resemblance to some of the Great Northern Railway's practice in earlier times. She also retained her original

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brake ejector, which was made by Gresham and Craven. Neither engine was fitted with a Belpaire firebox, although the actual firebox was flat-roofed. Both engines carried a boiler pressure of 140 lbs. per square inch, and had driving wheels of about 5 ft. 6 in. in diameter. They were fitted with Stephenson's link motion. Of dates, &c., I have no knowledge. I would also mention that, some seven or eight years ago, I saw a small 2-4-2T. of the Port Talbot Railway working the Great Western Railway trains between Llandovery and Llanelly."

Mr. T. R. Perkins now sends a photograph (reproduced) taken in 1911 by his brother, Mr. G. M. Perkins, showing 2-4-2 tank engine *Cader Idris* (taken over from the Manchester and Milford Railway) attached to the branch train at Newcastle Elmyn. Formerly painted black, the engine then had the standard Great Western green, but was otherwise unaltered except for the Great Western number-plate and safety valve.

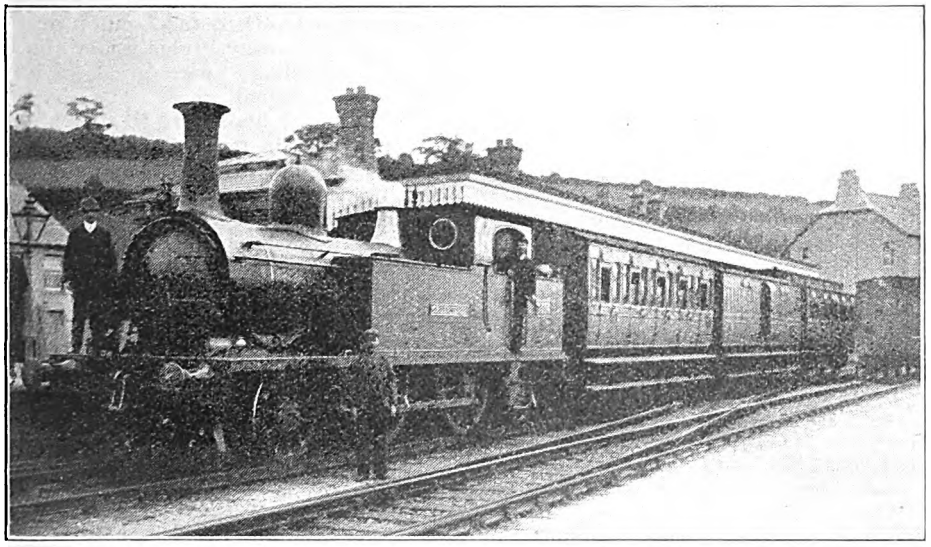

Photo.] 2-4-2 TANK ENGINE No. 1,406 "CADER IDRIS." [*G. M. Perkins.*

This engine was taken over from the Manchester and Milford Railway. Photograph taken in 1911.

A Triple Collision.

On August 31, at 12.14 a.m., at Canfield Place, near Marylebone, L.N.E.R., a triple collision occurred. The 11.44 p.m. up passenger train from Wembley Exhibition station to Marylebone was waiting at an automatic signal (U36T) for permission to proceed. It was followed by a light engine which came to a stand close behind it. Shortly afterwards the 11.52 p.m. up passenger train from Wembley Hill station to Marylebone came up on the same line and collided with the light engine. The blow drove the light engine forward into the rear of the first train, and considerable damage to stock resulted. Fortunately, no passengers occupied the compartments, which were demolished, and the fireman of the second passenger train alone was slightly injured. The first passenger train (Wembley Exhibition) was drawn by 4-6-2 tank engine No. 5129, and included six eight-wheeled bogie vehicles. The first and last of these vehicles had armoured ends with collision buffers and fenders. The light engine was No. 458, 4-6-0 tender locomotive. The second passenger train was drawn by tank engine No. 451, of similar type and weight to No. 5129, and also comprised six eight-wheeled bogie vehicles.

After the collision it was found that the first train was divided, owing to the coupling between the engine and the first vehicle having broken, and that a space of an engine's length (about 43 feet) separated the two vehicles. The light engine was standing close up to the rear carriage brake with its bogie wheels derailed. The engine of the second passenger train was uncoupled from the front vehicle, and was standing bedded in the framing of the tender of engine No. 458, separated by about an engine length from the carriage brake van No. 861. With regard to the coaching stock, the leading

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armoured end of carriage brake No. 955C mounted the frame of third-class coach No. 491, two compartments of which were crushed together and destroyed and a third badly damaged. The underframe of No. 491 was badly bent. The leading brake compartment of No. 861 was also completely destroyed, and the underframe buckled downwards for about 6 ft. of its length.

Automatic Signalling Rules.

AUTOMATIC colour light (three-position) signalling is installed on the company's main double road between Marylebone station (goods yard) and Neasden South, a distance of about five miles; also, on the single line loop to Wembley Exhibition station. The installation as a whole has been in use since April, 1924. Up trains are bell-signalled from Neasden South signal box to Marylebone Goods Yard box, and the approach of the trains over the various track-circuited sections is shown in the latter on an illuminated diagram. In order to legislate for the occasional failure of an automatic signal, rules for permitting drivers to pass such signals in the danger position have been made, and read as follows :—

When a driver finds an automatic signal (except the one marked U36T) *at danger, he must, if the signal indication be not changed in the interval, wait one minute, then give one long whistle and pass the signal at danger, proceed with great caution to the next signal ahead, keeping a sharp look-out and running at such a speed as will enable him to stop short of any obstruction that may exist. In the case of Automatic Signal* U36T, *drivers finding this signal in the "on" position must not go forward whilst the signal is at danger until they have communicated with the signalman at the Marylebone goods yard by means of the telephone provided at the signal, and have obtained his permission for this to be done. Should the signal be defective, instructions to the driver to pass the signal at danger must not be given, when the track circuit ahead of the signal is working correctly, until the track indicator shows "track clear." If the track circuit is also out of use, the order to the driver to pass the signal at danger must not be given until the signalman has reason to believe the section ahead of the defective signal is clear.*

A Moment's Inattention.

IN his report to the Ministry of Transport, Colonel J. W. Pringle points out that there was no failure in this case of any of the automatic signals to function properly, and no misunderstanding or misreading of the colour signals displayed. The questions at issue are whether the enginemen concerned obeyed the rule above quoted for working with automatic signals, and the adequacy of the rule from the point of view of safety. His conclusion is that the second (Wembley Hill) train, after stopping at signal 50A and surmounting the rise extending for a distance of about 280 yards to the London Midland and Scottish Railway bridge under the line, was not travelling "with great caution" to the next signal, 36T. The driver of No. 451 ascribed his failure to stop short of the obstruction in front of him to the fact that his engine wheels picked up. The inspector does not accept this explanation, expressing the opinion that the driver was either temporarily inattentive, and was, therefore, taken by surprise when he caught sight of the red light in front of him, or he completely misjudged his speed. He therefore finds that this driver, after passing the Kilburn viaduct, was not proceeding with the caution indicated in the rule quoted. The wording of the rule is, in the inspector's opinion, insufficient to inculcate the degree of caution with which all drivers should proceed after passing an automatic signal in the danger position. Some addition, therefore, is necessary in the interests of safety. He suggests that after the words "with great caution" the rule should read—"at a speed not exceeding five miles an hour to the next signal ahead, unless in the meantime the light of that signal is observed to change to caution or clear, keeping a sharp look-out and being prepared to stop short of any obstruction that may exist."

"This or similar wording is adopted in the rules on the subject of other steam lines equipped with automatic signals, and the company should be asked whether they are prepared to amend the rule accordingly."

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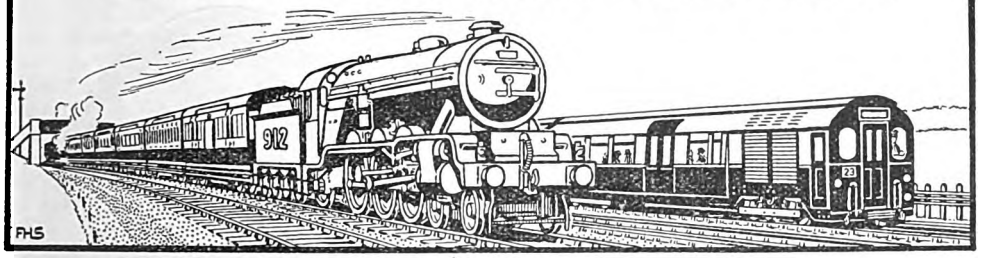
WHAT THE RAILWAYS ARE DOING.



Mr. William H. Brown, J.P., retires on December 31, 1924, from the position of Secretary of the Metropolitan Railway Company after more than 52 years' service, a period which has not been attained by any other officer or servant of the company. Starting as a junior in the Audit Office in 1872, Mr. Brown rapidly acquired a knowledge of the work in the various sections of the department, and after filling several responsible positions in relation to traffic matters, was selected to organise the working of goods traffic by the company over its system, subsequently occupying at one and the same time the diverse positions of Goods Manager and Audit Accountant. Always a keen advocate for the welfare of the staff, he was largely instrumental in founding the Pension Fund of the company, now holding a strong financial position. From the inception of the Interchange Privilege Ticket system Mr. Brown worked untiringly to secure its full benefits for the employees of his railway. For 16 years he was Hon. Secretary of the Staff Benevolent Fund. He is a trustee of the Metropolitan Railway Provident Society, as well as of the Pension and Convalescent Funds. He served for a number of years on the Advisory Committee of one of the L.C.C. Technical Institutes, while he was one of the earliest students of the Railway Section of the London School of Economics. He is a Justice of the Peace for the County of Middlesex, serving the Willesden and Acton districts. The Directors of the Metropolitan Railway Company at a recent meeting unanimously adopted the following resolution :—

"That the Directors record their appreciation of the valuable services rendered by Mr. W. H. Brown during his 52 years' association with the company in the capacities of Audit Accountant, Goods Manager, and Secretary, and their hope that he may live for many years to enjoy his well-earned retirement."

MR. W. H. BROWN, J.P.,

Secretary, Metropolitan Railway, 1908–1924.

* * *

The death was recently announced of Mr. Thomas M'Gregor, late Works Manager at the Hyde Park Works of the North British Locomotive Co. Ltd. Mr. M'Gregor, who was in his eighty-fourth year, retired in 1917, having completed over fifty years' service in the locomotive building industry.

* * *

Mr. Black, now European Manager of the Colonisation Department of the Canadian National Railways, has been appointed Director of Colonisation and Development on the National Railway system, with headquarters at Montreal.

* * *

Mr. John Murray, O.B.E., who has been appointed Outdoor Assistant to Chief General Superintendent, L.M.S.R., previously held the office of Assistant General Superintendent (Midland Division), London Midland and Scottish Railway. Entering the service of the Midland Railway Company in 1887, Mr.

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Photo.] [*W. W. Winter.*

MR. JOHN MURRAY,

Outdoor Assistant to Chief General Superintendent, L.M.S.R.

MR. G. N. FORD,

Divisional Superintendent, Euston, L.M.S.R.

MR. S. B. CARTER,

Divisional Superintendent, Liverpool, L.M.S.R.

MR. T. W. ROYLE,

Divisional Superintendent, Manchester, L.M.S.R.

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Murray was first appointed as a junior clerk in the Superintendent's Department at Brecon, and, after experience at several stations, was promoted to the rank of Stationmaster in 1893, and to District Traffic Inspector for South Wales in 1899. In 1906 Mr. Murray was transferred to the staff of the District Superintendent for the Bristol area, and the following year was called to headquarters and engaged for some time under Mr. Cecil Paget in the establishment of train control on the Midland Railway. He was appointed Superintendent of Freight Trains in 1911.

* * *

Mr. George Newton Ford, who has been appointed Divisional Superintendent, Euston, L.M.S.R., entered North London Railway service in the General Manager's office in October, 1889, and, after obtaining experience in that and other departments, and becoming Outdoor Assistant to the Traffic Superintendent, was appointed Assistant Goods Manager on July 1, 1898, at Poplar, where the North London Railway Docks were situated. On the retirement of the late Mr. Thomas Day, he became, on January 1, 1899, Goods Manager, and when the late Mr. F. J. Dunn became General Manager, Mr. Ford was appointed Traffic Superintendent as from January 1, 1903. In 1909, when the working of the North London Railway was taken over by the London and North Western Railway, he became Assistant District Superintendent, London and North Western Railway, and Assistant Traffic Superintendent, North London Railway; also Secretary of the North and South Western Junction Railway Joint Committee. On the promotion of the late Mr. L. W. Horne, in August, 1911, Mr. Ford was appointed District Superintendent of the Southern Division, London and North Western Railway, and Traffic Superintendent of the North London Railway. As regards the latter, this was probably the only occasion when the same person has been definitely appointed a second time to the same position. He took over this appointment on the first day of the great railway strike of 1911. At the outbreak of war in 1914, Mr. Ford held a commission in the London Scottish, to which regiment he had belonged since 1896. He therefore served in France, was wounded in the face, jaw and neck, passed through the Staff College, was gazetted to the staff as Brigade Major, East Lancashire Reserve Brigade, and subsequently became Chief Staff Officer, Yorkshire Coast Defences. Mr. Ford has the following military distinctions: O.B.E. (Mil.), 1914–15 Star, General Service and Victory medals, and was mentioned in despatches. Mr. Ford retired with the rank of Major. During his official career, Mr. Ford has written many articles and pamphlets dealing particularly with "thrift" in so far as it affects the railwaymen. He has also taken great interest in the "safety first" movement, and by rigidly carrying out a continuous campaign in the Southern Division of the old London and North Western Railway since his appointment as Superintendent in 1911, and by enlisting the interest and efforts of his supervisory grades, excellent results have been obtained, so much so that in a recent period of 3½ years *no* Southern Division man was killed, and only one seriously injured out of a staff of nearly 5,000.

* * *

Mr. S. B. Carter, O.B.E., M.Inst.T., who has been appointed Divisional Superintendent, Liverpool, L.M.S.R., was educated at Fettes College, Edinburgh, and entered London and North Western Railway service in January, 1900. In June, 1904, he was appointed Outdoor Assistant to the Superintendent of the Line, being stationed at Chester, Crewe and Euston during that and following years. In January, 1910, he became District Superintendent in charge of the North Eastern District, with headquarters at Manchester, and in October, 1914, transferred to a similar office in charge of the Northern District with headquarters at Liverpool. On the amalgamation of the Lancashire and Yorkshire Railway with the London and North Western, Mr. Carter became, in January, 1922, Operating Assistant to the General Superintendent in charge of the Western Division, continuing in a similar capacity on the formation of the London Midland and Scottish Railway until taking up his new appointment as Divisional Superintendent with headquarters at Liverpool.

* * *

Mr. T. W. Royle, M.B.E., who has been appointed Divisional Superintendent, Manchester, L.M.S.R., had held the position of Assistant General Superintendent (Western Division) as from January 1, 1923. Previously he was Assistant General Superintendent (Northern Division), London and North Western Railway, as from January 1, 1922, on the amalgamation of the Lancashire and Yorkshire Railway with that company. Mr. Royle entered the service of the Lancashire and Yorkshire Company in 1898, and worked first in the passenger office, being subsequently transferred to the personal staff of the Passenger Superintendent. In October, 1914, he was appointed Confidential

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Assistant to the then Superintendent of the Line (Mr. Arthur Watson) in connection with the Railway Executive Committee. Mr. Royle was created a Member of the Order of the British Empire in January, 1918, for services rendered during the war. He was appointed Assistant Superintendent of the Line, Lancashire and Yorkshire Railway, in February, 1918.

* * *

MR. C. E. RILEY, who has been appointed Secretary to the Great Southern Railway Company (Ireland), entered the service of the Great Southern and Western Railway Company in the year 1891. In 1898 he was appointed Assistant Accountant, and in September, 1913, was appointed Accountant of the Great Southern and Western Railway Company. From 1917 to 1919 Mr. Riley acted as Chairman of the Accountants' Committee of the Irish Railways Executive Committee, after which he acted as Chairman of the Accountants' Committee of the Ministry of Transport. In 1923, on the retirement of the late Mr. Robert Crawford, he was appointed Secretary and Accountant of the Great Southern and Western Railway Company. Throughout his official career Mr. Riley has been a familiar figure at the Clearing House meetings. He holds the degree of Master of Arts in Dublin University.

Photo.] **MR. C. E. RILEY,** [*Lafayette.*

Secretary, Great Southern Railway (Ireland).

MR. PERCY A. CLEWS, who has been appointed European Traffic Manager to the Canadian National Railways, has been connected with that system or its components for the past 17 years, having entered the service of the old Grand Trunk Railway in January, 1907. Born in Rock Ferry, Cheshire, on January 19, 1882, Mr. Clews was educated at Birkenhead School. He was then apprenticed to a firm of shipping agents in Liverpool, with whom he served until the age of 25, when he entered the Grand Trunk Railway's Liverpool office. Two years later he came to London, and another two years found him transferred to Antwerp as Agent of the G.T.R. This post he held until 1914 when he was brought back to London as City Agent. January, 1919, marked another step in his career by his appointment as General Agent of the Freight and Express Departments of the Grand Trunk Railway. Within seven months he had risen to the position of General Agent and Assistant to the European Traffic Manager. When the consolidation of the Grand Trunk and Canadian National Railways took place in September, 1921, Mr. Clews became the General Freight Agent for Continental Traffic of the new organisation.

MR. PERCY A. CLEWS,

European Traffic Manager, Canadian National Railways.

* * *

Major C. L. Mason, R.E., M.I.Mech.E. who has been appointed Divisional Carriag

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and Wagon Superintendent at Wolverton, L.M.S.R., was educated at Marlborough and University College, London, and afterwards became a pupil of the late Mr. F. W. Webb, V.P.Inst.C.E., at the Crewe Locomotive Works of the L. and N.W. Railway Company. He was appointed Assistant to the Carriage Superintendent at Wolverton Works, L. and N.W. Railway, in 1900, and became Works Manager in January, 1908. He held that position until August, 1923, when he was appointed Divisional Carriage and Wagon Superintendent at Newton Heath, Manchester, L.M.S.R.

* * *

We regret to announce the death of Mr. J. A. Redford (who recently retired from the position of Divisional Cashier of the L.M.S. Railway Company), which took place on Friday, November 14, at his home, "The Beeches," Mobberley, Cheshire. Mr. Redford, who was in his 64th year, had been in failing health for some time, and was unable to be present at a re-union of officers of the former L. and Y. Company (of which company he was Chief Cashier) held at Liverpool on October 10, who met in connection with a presentation to Mr. Redford and two other officials of the L.M.S. Company. Mr. Redford entered the service of the L. and Y. in 1877, and was appointed Assistant Cashier in 1904; Chief Cashier in 1913. In 1922 he was appointed Divisional Cashier of the L. and N.W. Company, and a year later Divisional Cashier for the L.M.S.

* * *

Mr. John Quirey, who has been appointed Accountant General, L.M.S.R., with headquarters at Euston, has, since the formation of the London Midland and Scottish Railway, held the position of Joint Accountant. Prior to amalgamation, Mr. Quirey was Accountant to the Midland Railway Company, having succeeded Mr. Samuel Bower in that position in December at the end of 1919. Mr. Quirey joined the Belfast and Northern Counties Railway in July, 1882, in the audit office under the late Mr. John Gifford, where he remained over nine years. He was transferred to the accountant's office under the late Mr. Walter Bailey in December, 1891, and was appointed Accountant of what is now the Midland Railway Company's Northern Counties Section (Ireland) in April, 1914. In April, 1917, Mr. Quirey became Assistant Accountant to the Midland Railway Company, succeeding Mr. Bower, who had a month previously been appointed Accountant in succession to the late Mr. Walter Bailey, again succeeding Mr. Bower as Chief Accountant, as above noted.

Mr. James Frederick Gee, who has been appointed Chief Accountant, Euston, L.M.S.R., with control of the Audit Department, became Joint Accountant of the London Midland and Scottish Railway, on its formation, on January 1, 1923. Mr. Gee entered the London and North Western Railway service in 1884, at first in the Audit and Expenditure Department. In 1887 he was transferred to the office of the then Chief Accountant, Mr. Frederick Whittle. Mr. Gee was private Clerk to the late Mr. Parkhouse, and on the death of that gentleman in 1909, and the appointment of Mr. J. C. Isaac as Chief Accountant, Mr. Gee became Chief Clerk, and, in March, 1917, Assistant Accountant. He succeeded Mr. Isaac as Chief Accountant in August, 1920, and on January 1, 1922, became Accountant of the new London and North Western Railway Company, which was formed in consequence of the amalgamation of the London and North Western and Lancashire and Yorkshire Railways.

* * *

Mr. Frederick George Evans, C.B.E., who has been appointed Chief Stores Superintendent, Euston, L.M.S.R., had held the position of Audit Accountant since the formation of the London Midland and Scottish Railway. Prior to that he had been Audit Accountant of the London and North Western Railway on the amalgamation of the Lancashire and Yorkshire Railway therewith as from January 1, 1922, having been Chief of the Audit Department of the original London and North Western Company since 1914. Before receiving that appointment he had been Chief of the Coaching Division of the Audit Department at Euston, succeeding Mr. W. T. Powell as Chief Clerk in that department in January, 1914, becoming Audit Accountant later in the same year. In 1917 he was released by the board to enable him to devote himself to financial matters arising out of the work of the Director-General of Military Railways. He was made a Commander of the Order of the British Empire in 1920 in recognition of his services as a member of the War Office Railway Financial Commission, France.

* * *

Major W. H. C. Clay, who has been appointed Assistant Land and Estate Agent, Euston, L.M.S.R., was, early in 1923, made Divisional Land and Estate Agent (Midland Division), L.M.S.R. He was born in 1879, and obtained a Queen's Scholarship at Westminster School. After leaving Westminster in 1897 he took a three years' course in civil engineering at the Central Technical

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College, and obtained a diploma in civil engineering in 1900. He then became a pupil to the late Mr. J. A. McDonald, Chief Engineer of the Midland Railway, and became an Assistant in the Engineer's Department in 1902. In 1903 Mr. Clay was transferred to the Estate office. He was appointed Chief Assistant in 1906, and Assistant Estate Agent in 1910. In August, 1913, Mr. Clay was appointed Estate Agent of the Midland Railway Company. On the outbreak of war, Mr. Clay rejoined his unit and proceeded on active service early in 1915, being subsequently invalided home and ordered to the War Office in charge of the Quartering side of the Lands Directorate. He was three times "mentioned" for valuable services, and was awarded the Territorial Decoration, and the Order of the British Empire (Military Division). Mr. Clay is a Fellow of the Surveyors' Institution, an Associate Member of the Institution of Civil Engineers, and a Fellow of the Land Agents' Society. He obtained a Miller Prize for a paper before a students' meeting at the Institution of Civil Engineers, and has contributed to the Proceedings of the Surveyors' Institution.

* * *

WE are officially informed that the directors of the London and North Eastern Railway Company have made the following appointments, to date from January 1, 1925 :—

Mr. J. Miller, to be Engineer, North Eastern Area, York, in succession to Mr. C. F. Bengough, who will retire on December 31, 1924.

Mr. C. J. Brown, at present Engineer for the Great Northern & Great Central sections, to assume control of the engineering work of the Great Eastern section, in addition to his present duties, with the title of "Engineer, Southern Area."

Mr. F. G. Randall, Assistant Divisional Superintendent, Liverpool Street, to be appointed District Superintendent, Southern District, Great Eastern section, in succession to Mr. G. Keary, who will retire on December 31, 1924.

* * *

THE following staff changes have been made on the L.M.S.R. :—

Mr. C. L. Mason, Divisional Carriage and Wagon Superintendent, Newton Heath, to take up a similar position at Wolverton.

Mr. J. Armstrong, Solicitor Assistant, Manchester, to be transferred to the Parliamentary Department, Solicitor's Office, Euston.

Mr. I. Smith, Assistant Sack and Sheet Superintendent, Trent, to be Assistant Divisional Storekeeper (maintenance of sacks and sheets).

Mr. F. Holcroft, Goods Agent, Ashton (L.N.W.), will take charge of both stations at Ashton.

Mr. J. T. Cliffe, Goods Agent, Trafford Park (L.N.W.), becomes Goods Agent, Trafford Park and Manchester Docks.

Mr. A. J. Moore, Goods Agent, Park Lane, will be responsible for Wapping station as well.

Mr. J. O. Hignett, Goods Agent, Canada Dock, will be responsible for Bankfield station as well.

Mr. R. A. B. Warren, Goods Agent, Sandon and Canada Dock, and Alexandra and Langton Dock, becomes Goods Agent, Sandon and Canada Dock and North Docks.

Mr. W. J. Johnson, Goods Agent, Alexandra Dock, will be responsible for Alexandra and Langton Dock as well.

Mr. T. Holland, Goods Agent, Oldham, becomes Goods Agent, Rochdale, *vice* Mr. L. Thorpe, retired.

Mr. C. Boyce, Goods Agent, North Mersey, succeeds Mr. Holland at Oldham.

Mr. J. W. Bibby, Goods Agent, Wapping, succeeds Mr. Boyce at North Mersey.

Mr. H. A. Tatman, Sack Collector, Bedford, becomes Sack Superintendent (Commercial), Trent.

Mr. E. M. Phillip becomes Head of Rates, Euston, *vice* Mr. T. H. Green, deceased.

Mr. W. Horrobin, General Superintendent's office, Manchester, becomes Stationmaster and Yardmaster, Royton Junction.

Mr. L. P. Briggs, Stationmaster, Trent, becomes Stationmaster, Lancaster (Castle and Green Ayre), *vice* Mr. J. T. Murray, deceased.

Mr. J. M. Beaton, Parcel Agent, Edinbrugh, becomes Passenger Agent also.

Mr. K. R. N. Speir, District Operating Superintendent, Fenchurch Street, goes to Paris as Continental Passenger Agent.

Mr. E. Whitby, District Passenger Agent, Fenchurch Street, becomes Assistant Divisional Passenger Commercial Superintendent, London.

* * *

THE Minister of Transport, Lieutenant-Colonel Wilfrid Ashley, M.P., has appointed Captain A. S. C. Reid, D.F.C., M.P., to be his Parliamentary Private Secretary (unpaid).

* * *

THE Right Hon. James McMahon has been appointed a Director of the Dublin and South Eastern Railway Company, in place of the late Mr. John Bolger.

* * *

CAPTAIN A. RONALD S. NUTTING, M.C., has been co-opted a Director of the Great

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Northern Railway Company of Ireland in the place of Mr. H. S. Guinness, resigned.

* * *

THE Minister of Transport (Lieut.-Col. Right Hon. Wilfrid Ashley, M.P.) has appointed Mr. F. Gordon Tucker, O.B.E., T.D., to be his Private Secretary, and the Parliamentary Secretary to the Ministry (Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P.) has appointed Mr. C. A. Birtchnell to be his Private Secretary.

* * *

MR. J. IZAT, Executive Engineer, has been appointed Secretary to the Indian Railway Board.

* * *

SIR RALPH L. WEDGWOOD, C.B., C.M.G., Chief General Manager of the London and North Eastern Railway Company, and Chairman of the General Managers' Conference of the Railway Clearing House, has accepted the chairmanship of the Board of Management of the Railway Benevolent Institution for the ensuing year.

* * *

WE regret to announce the death of Mr. Herbert Lord, late Chief of the Publicity Section at Manchester of the London Midland and Scottish Railway. Mr. Lord had been connected with the former L. and Y. Railway for a period of thirty-five years, and was well known in the publicity world. Owing to failing health, he resigned his position with the company in December last. His demise will be regretted by his many business friends.

* * *

THE 125th concert of the L.N.E.R. Musical Society was held in the Hamilton Hall, Liverpool Street Station Hotel, on Thursday, November 6. Mrs. G. F. Thurston, wife of Mr. G. F. Thurston, Joint Secretary, L.N.E.R., occupied the chair, and was presented with a silver and ivory mallet suitably inscribed. The Society's full orchestra, conducted as usual by Colonel William Johnson Galloway, rendered several orchestral items in the high-class style characteristic of all its performances. In addition, several of the solos rendered by Miss Jessie Hewson and Miss Ethel Barker had orchestral accompaniments. Sir R. L. Wedgwood, Chief General Manager, proposed a vote of thanks to Mrs. Thurston, mentioning that her husband had been a member of the Society since the days it first achieved fame. Mr. Alex. Wilson, Divisional General Manager, Southern Area, Chairman of the Society, seconded, and Mr. G. F. Thurston replied on behalf of his wife.

"MODERN DEVELOPMENT OF THE RAILWAY LOCOMOTIVE," was the subject of a paper read by Mr. W. H. Morton, M.I.Mech.E., Chief Engineer, Midland Great Western Railway, at the opening of the thirty-first session of Dublin University Engineering Students' Society in Trinity College, Dublin. Sir Robert Tate, M.A., K.B.E., proposed a vote of thanks to the lecturer. Mr. J. R. Bazin, M.I.Mech.E., seconded the vote, which was carried.

* * *

THE annual dinner of the L.N.E.R. Stratford Foremen's Association, which was established in 1900, took place on November 21, in the Liverpool Street Hotel. There was a gathering of upwards of 140, presided over by Mr. A. J. Gillies, Foreman of the Erecting Shop at Stratford, whilst Mr. W. Sime, Foreman of the Pattern Shop, was in the vice-chair. Amongst those present were:—Mr. H. N. Gresley, Chief Mechanical Engineer; Mr. C. W. L. Glaze, District Mechanical Engineer; Mr. T. O. Mein, Works Manager; Mr. A. W. Headley, Chief Clerk; and Mr. D. James, District Electrical Engineer.

* * *

THIS gathering has always been interesting from the fact that it calls together a number of retired officers, and on the present occasion there were present Mr. A. J. Hill, late Chief Mechanical Engineer, and Mr. Councillor A. Frost, late Running Inspector. Many other officers of the company would have been present but for the fact that another function clashed, but during the evening Messrs. J. Miller, Chief Civil Engineer, G.E. Section; F. V. Russell, of the General Manager's Department; S. A. Parnwell, late Divisional General Manager, and others, put in an appearance for a short time.

* * *

THE second "Underground" and L.G.O. staff meeting of the season was held at the Central Hall, Westminster, on Wednesday, November 19. The Cinema Hall attached to the L.G.O. Training School at Chelsea has hitherto been the venue for these meetings, but owing to the increasing number of applications received from the staffs wishing to attend it was found necessary to secure a larger hall. Eight hundred members of the administrative and supervisory staff attended the meeting, this being the largest assembly of its kind in the history of the companies. Mr. J. P. Thomas, Operating Manager (Railways), was the Chairman. After tea an interesting paper, entitled "Schedules: their Relation to Traffic and Labour Problems," was delivered by Mr. J. B. Mackinnon, Superintendent of Schedules. The paper was illustrated by lantern slides and films.

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THE annual general meeting of the Great Eastern A.A.A. was held at Liverpool Street station on a recent evening, when Mr. Stan. W. Frost, Hon. General Secretary, gave a most satisfactory report of the year's workings, and the Hon. Financial Secretary proved that the financial position was even better than twelve months ago. There are now 92 clubs on the G.E. section affiliated to this Association, embracing all sorts of sport. Mr. William Whitelaw, Chairman of the L.N.E.R., was elected President of the Association, and Lord Claud Hamilton elected a Past-President. The officers for the year are :—Chairman, Mr. John Miller; Vice-Chairman, Mr. A. Bisley; Hon. General Secretary, Mr. Stan. W. Frost; Asst. Hon. General Secretary, Mr. J. E. Smith; Hon. Financial Secretary, Mr. H. E. Snelling; and Hon. Press Secretary, Mr. W. A. H. Burrus.

* * *

THE first dance of the season of the L.N.E.R. Musical Society took place on November 14 in the Hamilton Hall of the Liverpool Street Hotel and, as usual, was a distinct success. It was a carnival night, and the large assembly, arrayed in suitably fashioned headgear of original and striking designs presented a gay and animated appearance. Amongst those present were: Colonel William Johnson Galloway (Director); Sir Ralph Wedgwood (Chief General Manager) and Lady Wedgwood; Sir Francis Dunnell (Chief Legal Adviser); and Messrs. E. A. Clear, A. L. MacLaren, Thomas Chew, L. Sydney Smith, John Miller, Geoffrey Marshall, W. R. Mole and H. Lees. The M.Cs. were Messrs. Percy Syder and David King, who carried out their duties in their customary able manner, whilst Mr. A. Vale acted as hon. secretary. The music was provided by the London and North Eastern Railway Musical Society's dance orchestra.

* * *

AN order has been received by Beyer, Peacock & Co. Ltd. for the construction of two exceptionally large and powerful "Garratt" locomotives for the Bengal-Nagpur Railway. These engines, which will rank as the most powerful locomotives in India, are of the 2-8-0-0-8-2 type, and each will weigh in working order approximately 170 tons. The cylinders, four in number, measure 20 by 26 in., and the coupled wheels have a diameter on tread of 4 ft. 8 in. A noteworthy feature of the design is the large grate area, in view of the use of low-grade coal, which is 67 sq. ft. The engines will be capable of hauling train loads of 1,500 tons on grades of 1 in 100 without assistance. They are constructed for the 5-ft. 6-in. gauge.

* * *

KING HAAKON opened the Rauma Railway on November 29. The line is a western branch of the Dovre Railway, which was completed in 1921, linking up Christiania and Trondhjem. Leaving the Dovre Railway at Dombaas, the Rauma Railway terminates at the tourist station of Aandalsnes, at the outfall of the Rauma River into the Romdalsfjord. Commercial development is expected from the fact that the line constitutes another link between the west coast fisheries and the interior.

* * *

OWING to working losses since the railway was opened in June, 1923, the passenger train service on the Welsh Highland Railway was discontinued from December 15 last, but goods traffic is being continued. It is understood that the passenger service will be resumed in the summer months.

* * *

ON Monday evening, November 17, the Railway Students' Association, London School of Economics, was addressed by Mr. J. F. Gairns, M.Inst.T., his subject being "Public Aspects of Railway Problems." A lengthy and interesting discussion followed.

* * *

IN order that locomotives on different sections of the L.N.E.R. may pick up water when working over other sections, it has been necessary to bring to the same level the water in the different troughs. On the G.N. Section it was found necessary to raise the water level 1 in.

* * *

THE North British Locomotive Co. Ltd. have received an order from the Southern Railway for 20 locomotives of the 4-6-0 type. They have also secured an order from the same company for eight boilers.

* * *

SEVERAL readers point out that the G.W.R. 4-cylinder 4-6-0 engine *Knight Templar*, illustrated on page 461 of the December RAILWAY MAGAZINE, is No. 4019, and not No. 4011 as stated.

* * *

HAWTHORN, LESLIE & CO. LTD. have secured an order for 13 passenger tank engines of the 4-6-2 type from the London and North Eastern Railway.

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THE RAILWAY MAGAZINE]

STEAM AND ELECTRIC LOCOMOTIVES, METROPOLITAN RAILWAY.

4-4-4 Tank Engine as employed north of Rickmansworth.
0-4-4-0 Electric Locomotive as used between City Stations and Rickmansworth.

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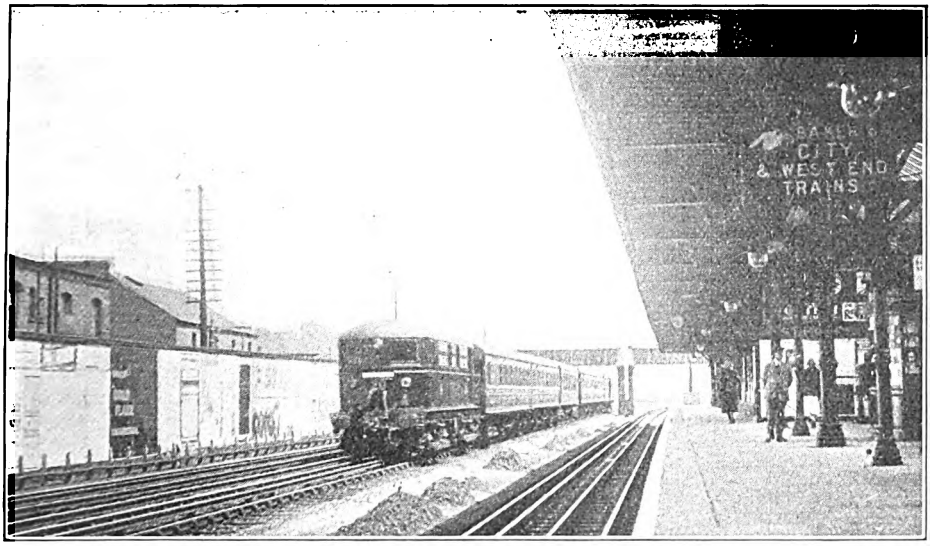

Photo.] [*J. F. Gairns.*

AYLESBURY PULLMAN CAR EXPRESS PASSING WEST HAMPSTEAD AT SPEED.
Rebuilt electric locomotive No. 20.

Traffic and Engineering Developments on the Metropolitan Railway.

INAUGURATION OF ELECTRIC TRACTION TO RICKMANSWORTH.

ON January 5 the Metropolitan Railway commenced to work its "Extension" line trains electrically as far as Rickmansworth, where, in future, steam and electric locomotives will be interchanged as required, instead of at Harrow as hitherto. The section of line converted from steam to electric traction is from Harrow in Middlesex to Rickmansworth in Hertfordshire, and will subsequently include the new branch, now nearing completion, which leaves the main line near Moor Park and Sandy Lodge station to reach the growing district of Croxley Green and the important town of Watford.

The introduction of electric traction on the Harrow-Rickmansworth section removes one of the factors which has hitherto hindered the provision of facilities fully commensurate with the great development for residence of the area which is now generally known as "Metro-land." It permits of increased speeds, smoother running and greater flexibility of operation, besides securing more rapid acceleration, experience having proved that an electric train can attain a speed of 30 miles per hour in 29 seconds, whereas 97 seconds are required by a steam train of corresponding weight to reach the same speed.

The present steam-operated line to Rickmansworth was opened for traffic in 1887. Since that date an increasing influx of residents to the towns served has occurred, so that places which were, in many cases, merely straggling villages, have become comparatively large and prosperous towns. As a case in point, it may be mentioned that the pre-railway population of Pinner was only 2,500, whereas to-day it has passed the 10,000 mark.

The present extension of electric traction

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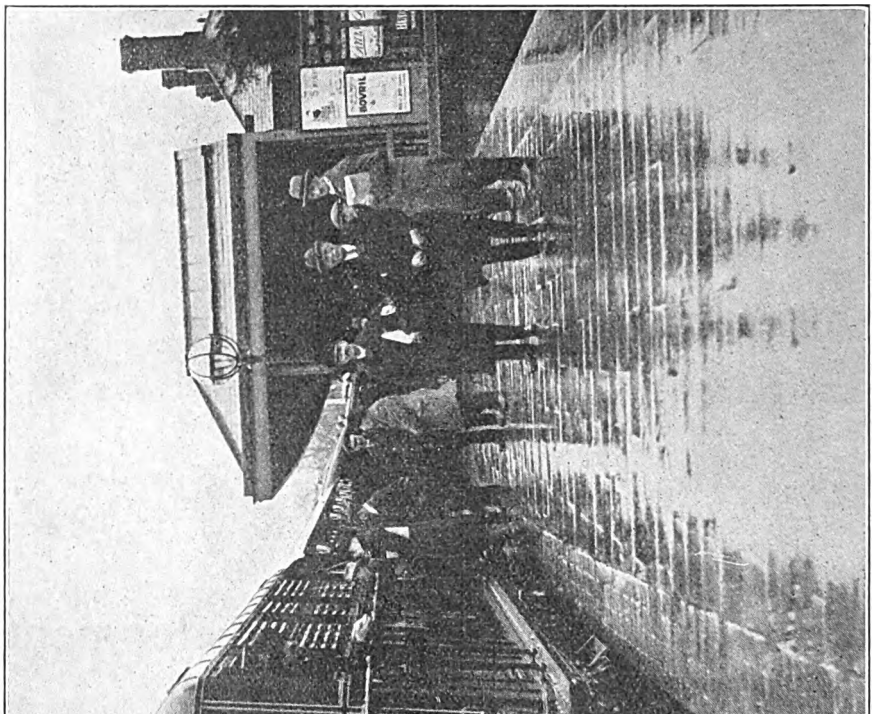

INAUGURAL ELECTRIC TRAIN AT RICKMANSWORTH STATION.

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avoids the delay caused by engine-changing operations previously carried out at either Wembley Park or Harrow, and permits of trains being run non-stop from Baker Street to Rickmansworth in 25 minutes. Further, it is now possible to increase the density of traffic; also to secure the higher acceleration of speed which electric traction renders possible.

Extensive electrified "stabling" and shunting lines have been provided at the various stations to facilitate the movement of trains, and numerous lines in goods yards have also been electrified to enable goods trains to be expeditiously dealt with by means of electric locomotives when desired. The electrification has been carried out without any disturbance of the heavy steam train service operating between Harrow-on-the-Hill and Rickmansworth.

Interconnected with the transition from steam to electric traction of the section of line from Harrow-on-the-Hill to Rickmansworth, it was decided to abolish the existing mechanical lock-and-block and semaphore system of signalling, and to introduce in its stead electric automatic signalling, utilising three-colour light signals. This necessitated the provision of 113 alternating-current track circuits, and the fixing of illuminated diagrams in the signal-boxes, together with the introduction of other contrivances contributing to the efficient handling of heavy traffic under normal or abnormal conditions.

Sixty three-colour light type signals have been installed, and these are provided with red, yellow and green lenses, illuminated by powerful electric lamps, of sufficient brilliancy to ensure that even in full sunlight they can be duly observed from a distance of over 1,000 yards. In addition, these signals have a new feature in the shape of a side light which gives a driver of a train standing at a signal, but out of its direct line of sight, a side view of whatever light is illuminated. A new type of shunting signal has also been introduced, with a white enamelled front and red band in place of the previously-used miniature arm signals.

The signal cabins *en route* have been provided with illuminated diagrams which show the whole of the tracks controlled by the respective cabins. On these the various tracks are illuminated from behind by small electric lamps, and by means of track circuits the presence and movements of each train are indicated by the darkening or lighting up of the various sections of track shown on the diagrams, thereby enabling the signalman to locate within definite limits the position of every train in the area he controls.

It may here be mentioned that, whilst practically all the manually-operated semaphore signals have been replaced by day colour light electric signals, the old mechanical frames and interlocking in the signal cabins are being retained and are being utilised for the working of the new electric installation. The new signal plant has been provided by the Westinghouse Brake and Saxby Signal Co. Ltd., who were also responsible for installation under the direction of the Metropolitan Railway signal staff.

This undertaking adds 23 further miles of electrically-equipped track to the Metropolitan system. As a result, it has become possible to provide accelerated trains to and from stations between Harrow and Rickmansworth, as well as additional facilities, and in this connection it is interesting to note that several trains hitherto booked non-stop from Baker Street to Rickmansworth—a distance of 17½ miles—are now able to make the journey in 24 or 25 minutes, while other trains not booked to call at Harrow or Wembley Park are similarly accelerated. Current is, of course, supplied from the Neasden Power House, where additional equipment has been provided in the shape of a new 20,000-h.p. turbo-generator. This power station is, by the way, the largest in the United Kingdom owned by a single railway company.

Current is distributed to the newly electrified section of line by means of heavy three-core armoured cables to three specially located sub-stations, the first being the existing Harrow sub-station which has been enlarged to nearly 4,000-kw. capacity; the second situated at Northwood; and the third at Rickmansworth, at a point where the Watford branch forks from the main line.

While dealing with this very important development, reference may be made to the new junctions which are being provided at Harrow. A pictorial

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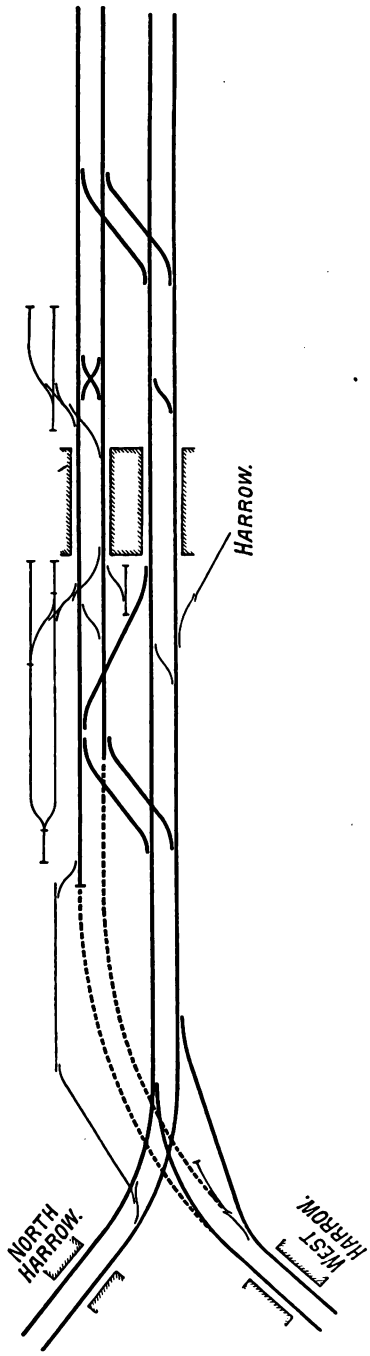

SKETCH PLAN OF LINES AT HARROW SHOWING TEMPORARY (FULL LINES) ALTERATIONS AND CONTEMPLATED (DOTTED LINES) LAY-OUT.

illustration showing how this work will appear when completed is reproduced. Work upon this is already well advanced, and it is anticipated that the new connections will be ready for service at an early date. Its great value will be that trains to and from the Uxbridge branch will not need to interfere with traffic on the direct line to Rickmansworth and Aylesbury, while the fact that all four lines at Harrow can be utilised by electric trains will be of further assistance in facilitating operation at busy periods; an important factor where traffic is so heavy, as on the Metropolitan electrified routes.

Reference may also be made to the new Watford line, now in its final stages. This will be a double-track branch, leaving the present line at a point north of Moor Park and Sandy Lodge station, thence proceeding to Croxley Green and Watford. Although this new branch is only 2½ miles in length, the works have presented considerable difficulty. It has entailed the excavation of half a million cubic yards of gravel and chalk, the construction of a number of heavy embankments, the building of 10 bridges, and the laying-out of goods yards. The most important bridges are those over the River Gade, the Grand Junction Canal, and the railway at Croxley Green. In the case of the first-named bridge, it was found necessary, owing to the presence of water in the chalk abutments, to have recourse to expensive monolith construction and extensive timber piling. The Croxley Green bridge is also interesting, inasmuch as it had to be constructed to carry not only the roadway, which has been temporarily diverted, but the station buildings.

The new Watford extension line, the first mile and a half of which is practically all in cutting, will cost approximately £300,000, and will be equipped for electric traction and be protected throughout its whole length by the latest type of automatic signalling. A northern spur and junction is also being provided in order that a "shuttle" service to and from Rickmansworth may be operated, in addition to the through trains to and from Baker Street and the "City," and that the working of goods and passenger traffic direct to Watford from the north may also be possible.

It is anticipated that this branch will

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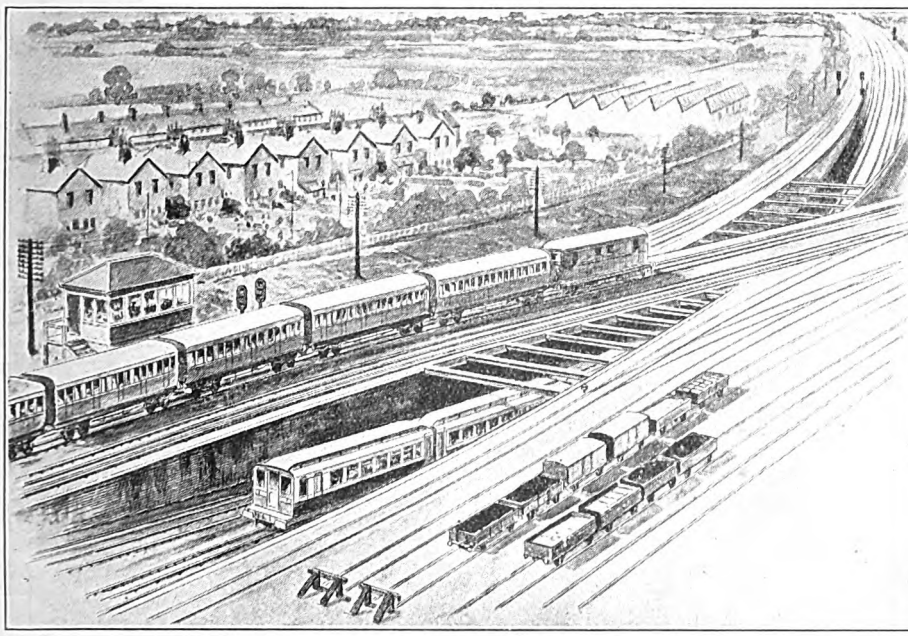
be open during the spring, and when this occurs Watford will have the advantage of additional electric train services to and from London, with the advantage of through working to City stations between Baker Street and Liverpool Street or Aldgate, while a new area offering many residential attractions will be opened up for development.

Still another Metropolitan development requires reference here, though it is one affecting the Inner Circle, as well as the through services between City stations and the Metropolitan country lines and branches, also the Hammersmith and City trains. Work is already in hand in connection with the engineering operations involved adjacent to the St. Pancras Hotel, entailing the linking up and utilisation of an old length of tunnel that runs parallel with the "Metro" line from a point east of Euston Square to St. Pancras. When completed this will provide a means for switching over Metropolitan trains to the "widened" lines between King's Cross and Moorgate, thus securing an alternative direct route as far as the latter station. To gain access to the tunnel in question, which was constructed about sixty years ago and is approximately 1,200 ft. in length, it will be necessary to remove a considerable portion of the tunnel wall and to construct about 700 ft. of new single tunnel, in addition to providing a junction at the eastern end of the old tunnel, in order that the "widened" lines may be reached.

The work, which is now being rapidly proceeded with, is being carried out on the cut-and-cover system, and involves, among other matters, the placing in position of a series of heavy steel girders to support the road and neighbouring buildings. The work of construction is difficult owing to the numerous obstacles that have to be overcome, and more particularly to the fact that the whole of the work must be carried out without interfering with the existing train service. Concurrently with these important engineering operations, the Metropolitan Company will equip for electric traction the "widened" lines which extend from King's Cross to Moorgate, and over which now operate the steam trains of the Great Northern section of the London and North Eastern Railway and the Midland section trains of the London Midland and Scottish Railway.



PICTORIAL VIEW OF NEW JUNCTION AT HARROW.

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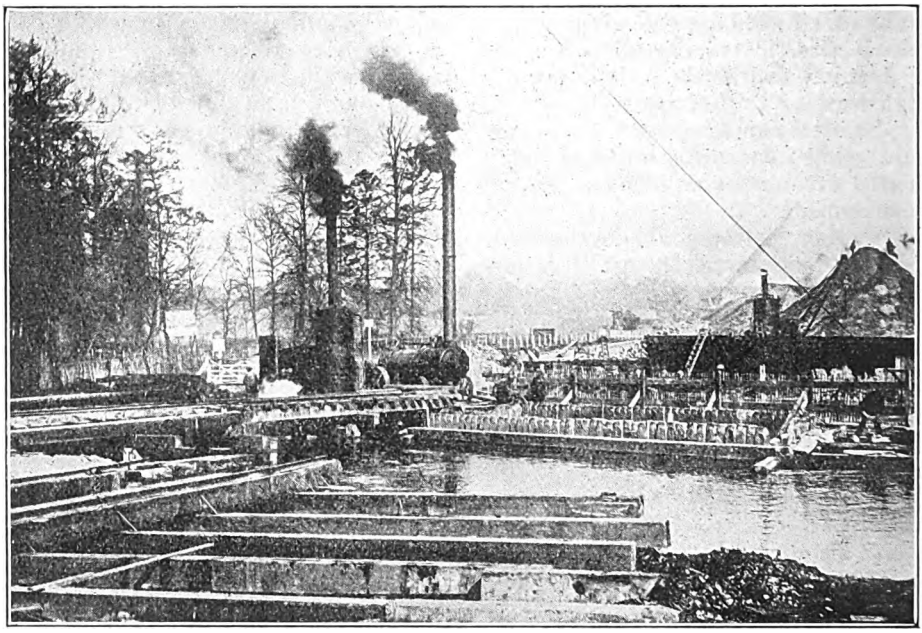
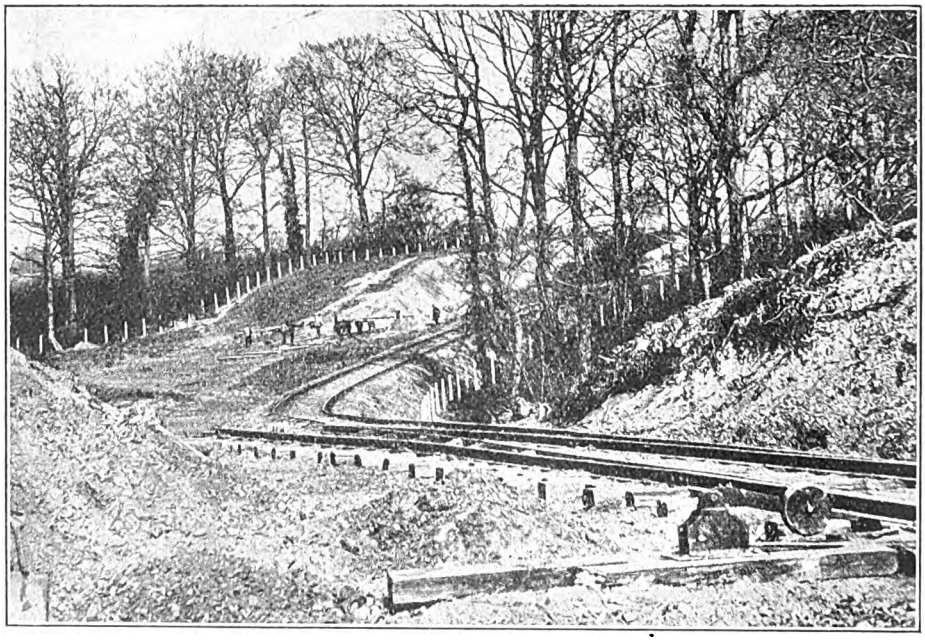


PILE DRIVING OPERATIONS AT THE RIVER GADE BRIDGE.



NEW LINE IN COURSE OF CONSTRUCTION.

SCENES ON THE NEW WATFORD BRANCH.

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Locomotive and Train Working in the latter part of the 19th Century.

METROPOLITAN AND METROPOLITAN DISTRICT RAILWAYS. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 443, *December*, 1924.)

IT is now time to say something of the District Railway, or, to give it its proper title, the Metropolitan District Railway. For the historical account of the various lines forming this company the reader may be referred to the "Railway Year Book." Suffice it to say that that section forming part of the Inner Circle was opened from Kensington to Westminster on December 24, 1868, and was extended to Blackfriars in 1870, and to Mansion House in 1871.

Until 1871 the District line was worked by Metropolitan engines and trains, but on the completion of the section of line between Blackfriars and Mansion House in 1871, the District Company decided to provide its own locomotives and rolling-stock.

The locomotives were, except in regard to certain outward details, practically the same as those of the Metropolitan, *i.e.*, of the outside-cylinder 4-4-0 type. There were ultimately 54 engines of this design in all, of which Nos. 1 to 24 were built in 1871, 25 to 30 in 1876, 31 to 36 in 1881, 37 to 42 in 1883, 43 to 48 in 1884, and 49 to 54 in 1886; and all came from Messrs. Beyer, Peacock and Co., Manchester.

The first 24 engines had longer and deeper fireboxes, and, like the early Metropolitan engines, were provided with four-wheeled Bissell radial swivelling trucks. These were subsequently altered to four-wheeled bogies on the Adams system. It may be mentioned that these bogies, like those of the later Metropolitan engines, presented certain features not usually met with in main line engines. They had cast-iron pivots, and the centres rested on blocks of hard-wood 2 ft. diam. by 4 in. thick. The check springs, like those of Mr. Adams' early North London engines, were of india-rubber.

In outward details there were some differences from the similar engines of the Metropolitan Railway. The chimneys were of a shape not unlike those of Mr. Stirling's Great Northern engines of the 1884–95 period; the domes were round-topped and of polished brass. The first 36 engines originally had spring-balance safety valves on ornamental domes of the Metropolitan shape, but the subsequent engines were provided with plain closed-in dome covers, and Ramsbottom safety valves were placed over the fireboxes. In all cases the dome was situated on the front ring of the boiler barrel, immediately behind the chimney. The weather-boards differed from the plain straight ones of the Metropolitan in being bent slightly backwards over the footplate. The colour of the engines was a dull green, and remained thus until the engines disappeared on the electrification of the line.

But although the District Railway adopted the Metropolitan type of locomotive, it did not copy the carriage stock of the latter railway. Instead of the eight-wheeled coaches with radial axle-boxes, the District used four-wheeled coaches only, of much lighter weight.

The Inner Circle was not completed until October, 1884, when the section, the joint property of the Metropolitan and the District Companies, was opened between Mansion House and Aldgate. This also gave the District Railway access to Whitechapel, and later (during the present century) to Bow and the London, Tilbury and Southend Railway.

The train services and locomotive working of the Metropolitan Railway at this period were comparatively simple. In

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the first place, there were the Inner Circle trains, the working of which, after the completion of the connecting link between Aldgate and Mansion House in 1884, was shared with the District Railway, each company then working alternate trains. The trains between Aldgate and Hammersmith were worked by both the Metropolitan and Great Western, but those to and from Addison Road (Kensington) were under the charge of the Great Western only. On the east side of Aldgate many of the Hammersmith trains ran through to and from New Cross (S.E. & C.R.). These were worked entirely by Metropolitan engines and stock.

At one time the trains from the St. John's Wood line worked over the Baker Street junction to the City, but the increasing traffic over this section eventually compelled the company to close the Baker Street junction for ordinary passenger traffic, and the trains from the northern extension stopped at Baker Street, where passengers to and from the City had to change. The junction was opened at night to allow engines and ballast trains to proceed from the City end to Neasden. This arrangement continued until some time after the lines had been electrified.

Before 1880, when the northern extension through Neasden was opened, the Metropolitan engines were chiefly stabled in small, out-of-the-way corners at Edgware Road, Farringdon Street, and Aldgate, the principal shed being at Edgware Road. Afterwards as many engines as possible were moved to Neasden, though Edgware Road continued in use for some years as a secondary locomotive station.

Turning to the District Railway, the trains radiated, as now, from Earl's Court, the main services being to Richmond from 1877, to Ealing from 1879, to Hounslow from 1883, and to Putney Bridge from 1880. For more than 2½ years, from March, 1883, District trains ran through from Mansion House to Windsor over the Great Western Railway from Ealing, but the Great Western eventually, in September, 1885, caused this service to be discontinued. Nearly all the District engines were stationed at Lillie Bridge, in the fork near West Kensington station.

Of the 54 engines which the District Railway owned when the lines were electrified, two only now remain, Nos. 33

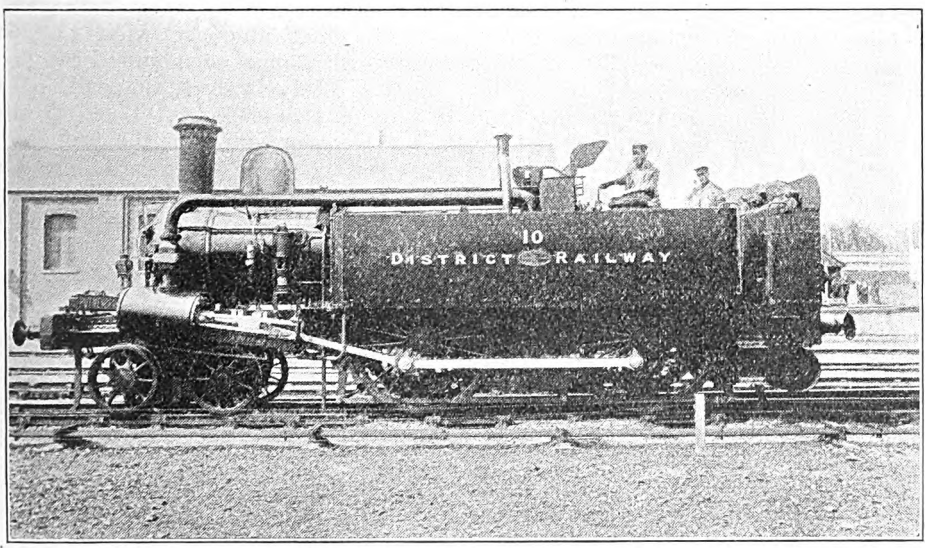

Photo.] [*Loco. Publishing Co. Ltd.*

METROPOLITAN DISTRICT RAILWAY 4-4-0 TANK ENGINE No. 10.

Built by Beyer, Peacock & Co. Ltd.
Coupled wheels, 5-ft. 9-in. diam. Cylinders, 17 in. by 24 in.

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and 34. They are retained at Lillie Bridge for ballast and break-down trains. After the electrification the remainder, following the example of the dead donkey and an Iberian queen's legs, were not seen, and what became of them I am unable to state.

Of the 66 4-4-0 engines of the Metropolitan, about 13 remain in service. Six, Nos. 10, 11, 12, 13, 15 and 66, were sold to the Cambrian Railways, and two, Nos. 20 and 34, to the light railway in Yorkshire between Pateley Bridge and Wath-in-Nidderdale, the property of the Bradford Corporation; No. 14 was sold to the Hetton Colliery Company, Durham; No. 28 to the Sherwood Colliery Company, Nottinghamshire; and No. 37 to the Somerset Mineral Railway. There may be a few others in service in various parts of the country, but the writer has no knowledge of them.

The northern extension railway of the Metropolitan into Buckinghamshire was due to the efforts of the late Sir Edward Watkin, then chairman, not only of this company, but also of the Manchester, Sheffield and Lincolnshire Railway. His ambitious scheme was to connect the two railways and make a new main line into London from the north, which would render the provincial railway independent of the Great Northern, with which it had hitherto been working in partnership. In the north the Manchester, Sheffield and Lincolnshire line gradually crept southward to Annesley, some miles north of Nottingham, and by the same process the Metropolitan gradually extended northwards, to Pinner in 1885, to Rickmansworth in 1887, and to Chesham in 1889. From Chalfont Road a line was opened to Aylesbury in 1892, after the Aylesbury and Verney Junction line had been incorporated in the Metropolitan in 1891. It resulted that a purely London local underground railway developed into a country line 50½ miles in length from Baker Street to Verney Junction, most of which came to be included in the present Great Central main line from the north to London.

For some years the line from Baker Street to Chesham was worked entirely by the standard outside cylinder 4-4-0 tank engines, but in 1891 a radical change in Metropolitan locomotive practice began. Sir Edward Watkin was also chairman of the South Eastern Railway, and as this company was at that time having engines built by Messrs. Neilson & Co., it was suggested to the directors of the Metropolitan that time and trouble would be saved by having some similar engines built by the same firm.

The four new engines, Nos. 67 to 70, were 0-4-4 side tank engines with inside cylinders of practically Mr. James Stirling's South Eastern design, with 5-ft. 7-in. coupled wheels and 18-in. by 26-in. cylinders. Certain modifications were incorporated to harmonise with the ideas of the locomotive engineer of the Metropolitan, chief amongst which was the addition of domes surmounted by spring-balance safety valves, instead of the Stirling domeless boiler. Lock-up safety valves were provided on the firebox. In these respects the engines followed the practice on the Midland Railway. The heating surface was 921½ sq. ft. and the boiler pressure 140 lb. per sq. in. They were supplied with condensing apparatus. The first of the new engines started its career in a very unfortunate manner by slipping badly, when working its first passenger train, and finally sticking in the tunnel near Marlborough Road. The steam and fumes were so bad that the men were badly affected, and, as a crowning finale, the train was run into from the rear by one following from Baker Street.

At a later date these four engines had the cylinders reduced in diameter from 18 in. to 17 in., and are now running with new and somewhat larger boilers with polished brass domes.

Nearly four years elapsed before more locomotives were built, but in 1895 six 2-4-0 side tank engines of an entirely different type were built by Messrs. Sharp, Stewart & Co. Ltd. These engines were almost identical with some which the same firm had previously built for the Barry Railway. The first two of them were intended for the Aylesbury and Buckingham Railway, which since 1891 had been worked by two London and North Western tank engines loaned to the Metropolitan. Consequently, these two engines, Nos. 71 and 72, were not fitted with condensing apparatus. They had 5-ft. 3-in. coupled wheels, 17-in. by 24-in.

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cylinders, 1,091 sq. ft. of heating surface, and 150 lb. pressure. The leading wheels had radial axle-boxes of the Webb pattern. The four following engines, Nos. 73 to 76, which came out a few months later, differed somewhat from Nos. 71 and 72, chiefly in that the coupled wheel centres spaced 8 ft. instead of 7 ft. 9 in. apart, and in having leading axle-boxes with lateral side play controlled by inclined planes. They were also supplied with condensing apparatus to work from Aylesbury into Baker Street. For some time they continued on this service, but during 1896–98 were replaced by the engines to be described below, and were afterwards transferred to the goods trains between Aylesbury and West Hampstead, on which service they have been employed for many years.

In 1896 the first engines built by the Metropolitan Railway Company itself at Neasden Works put in an appearance. These were Nos. 77 and 78, and were followed in 1898 by another similar engine, No. 1, which replaced the first of the outside cylinder 4-4-0 type, the latter having been badly damaged and removed from service. The new engines were of the 0-4-4 side-tank type, with 17-in. by 26-in. cylinders, 5-ft. 6-in. coupled wheels, and 150 lb. pressure. They were very similar to Nos. 67 to 70, but had larger boilers and water tanks.

Apart from one or two shunting tank engines, which need not be mentioned, the above completed the locomotive stock of the Metropolitan until the end of the century. It is to be noted that all the newer inside-cylinder engines were employed exclusively on the "extension" lines north of Baker Street, and, as far as my own personal knowledge goes, none of these were ever used on the older underground portion of the line between Aldgate and South Kensington, the traffic over which was worked from first to last by the 4-4-0 engines with outside cylinders, by Beyer, Peacock & Co. The latter engines were very economical and those on the District Railway averaged 30 lb. of coal per mile on heavy work. The average time between general (other than light shed) repairs was 2½ years.

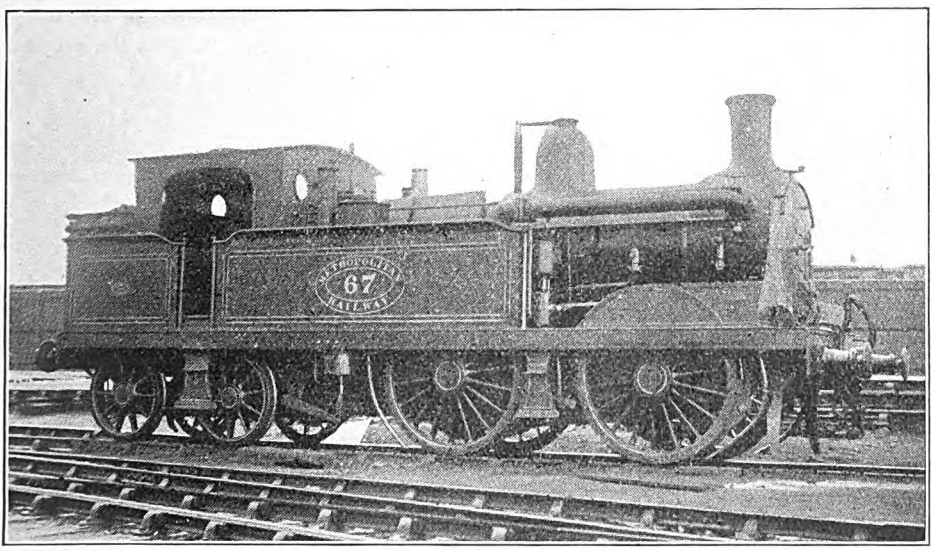

Photo.] [*Loco. Publishing Co. Ltd.*

METROPOLITAN RAILWAY 0-4-4 TANK ENGINE No. 67.

Built by Neilson & Co., 1891. Coupled wheels, 5-ft. 7-in. diam. Cylinders, 18 in. by 26 in.

The later locomotive working of the Circle trains was somewhat peculiar. The whole of the trains on the outer rail, that is, those from South Kensington to Aldgate *via* King's Cross, and thence to South Kensington *via* Mansion House, were worked

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by Metropolitan engines. Changes of engines, when required, were made at South Kensington, where the trains frequently waited as long as ten minutes. The engines were stabled at Edgware Road, and ran light to South Kensington for changing purposes. Water was taken at Aldgate by the engines working the Circle trains.

On the inner rail—that is, for trains working round the Circle in the opposite direction—the locomotive power was provided principally by the District Railway, though not entirely so, for a few trains were worked by the Metropolitan engines, probably in order to distribute the mileage in the ratio of the length of line belonging to each company. All the changing of engines on the inner rail took place at Kensington (High Street), and this applied to both District and Metropolitan engines. Water was also taken at Aldgate for the inner rail trains.

Three Metropolitan engines, coupled together, used to arrive at Gloucester Road station from Edgware Road at about 5.45 p.m. on Sundays to take up the 10-minute Circle service which began at about 6 o'clock. One engine ran forward to South Kensington, and the two others took out trains which were standing outside Gloucester Road.

A District engine used to stand in the dock road at South Kensington on Sundays during the church interval, and to prevent any mishap the regulator handle was always removed so long as the engine was not in service.

PILGRIM TRAFFIC TO LOURDES.

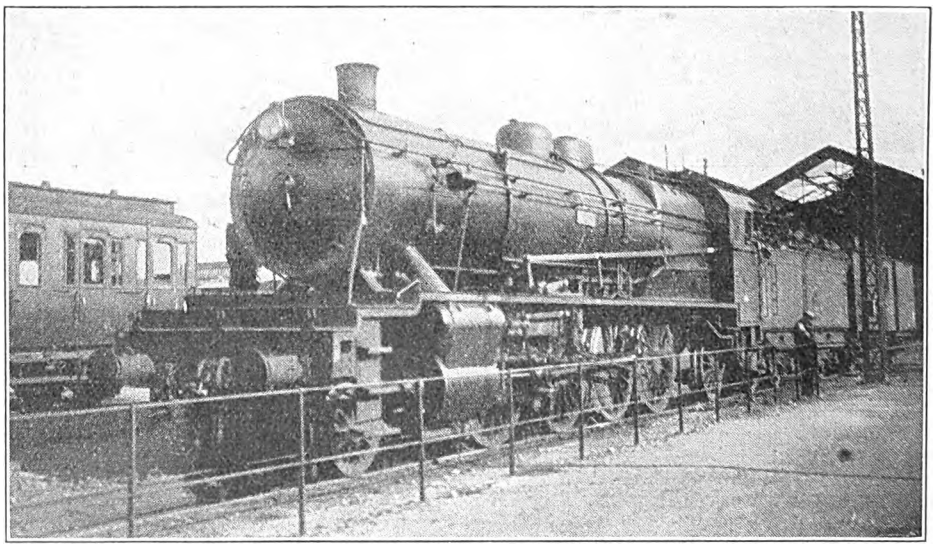

Photo.] [*R. Hogan.*

SPECIAL TRAIN AT BORDEAUX IN CONNECTION WITH SALFORD DIOCESAN PILGRIMAGE.

P.L.M. 2-8-2 locomotive No. 141-187.

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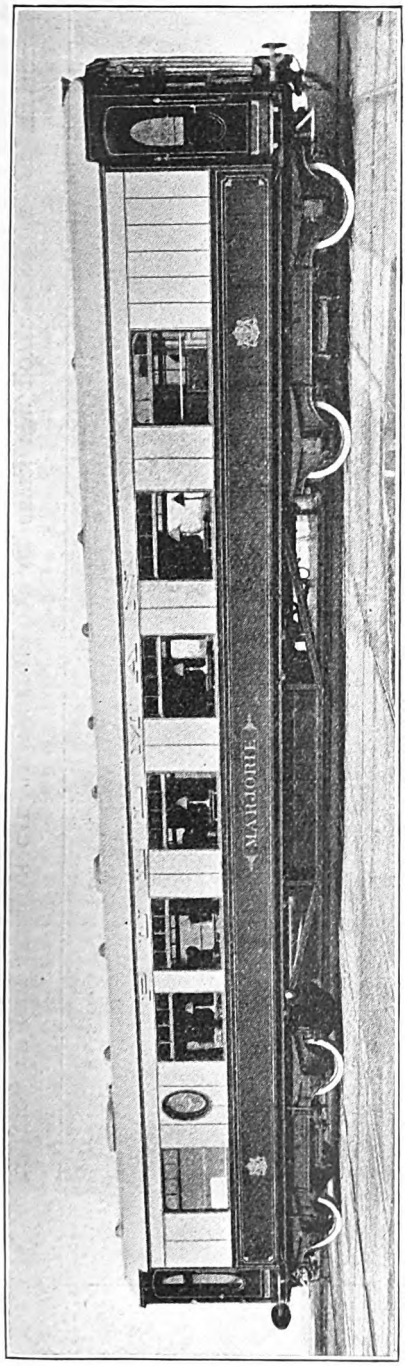
New Pullman Cars for Continental Services, Southern Railway.



PULLMAN CAR "MARJORIE" FOR CONTINENTAL SERVICES, S.R.

AT first regarded as a transatlantic innovation, to be accepted with diffidence and insular prejudice, the British-designed and British-built Pullman car, which already has a history covering many years behind it, has now become an essential factor in British railway travel. There are, indeed, nearly 200 Pullman cars now in service on British railways, and three of the four great companies of to-day run them, in several instances in complete trains, as in the case of the "Southern Belle" and the Harrogate and Sheffield Pullman Car expresses. They are to be met with as far north as Aberdeen in Scotland, and at practically all the South Coast resorts from Ramsgate and Margate and round to Portsmouth, and on particular services elsewhere, including even Metropolitan trains on the London-Aylesbury route.

It was not, however, until March, 1910, that Pullman cars came to be included in the Continental boat expresses between London and Dover or Folkestone, though the Continental Pullmans have since come to be among the most popular of all the numerous Pullman services now operated.

To meet requirements it has been necessary to add new cars from time to time, while each series has incorporated improved details of design, construction and equipment, though without departure from the standard Pullman characteristics which have done so much to popularise "luxury travel" at small supplementary charges. This steady process of improvement and development finds its culmination in the latest series of cars recently placed in service.

Built by the Midland Railway Carriage & Wagon Co. Ltd., at Birmingham, to the order of the Pullman Car Company, and of British design and construction throughout, the new vehicles are used on the 10.50 a.m. services from Victoria to Dover and the 5.30 p.m. from Dover to London. All are of standard four-wheeled bogie type, but still further attention has been given to the springing, so essential to ensure easy and comfortable riding. An

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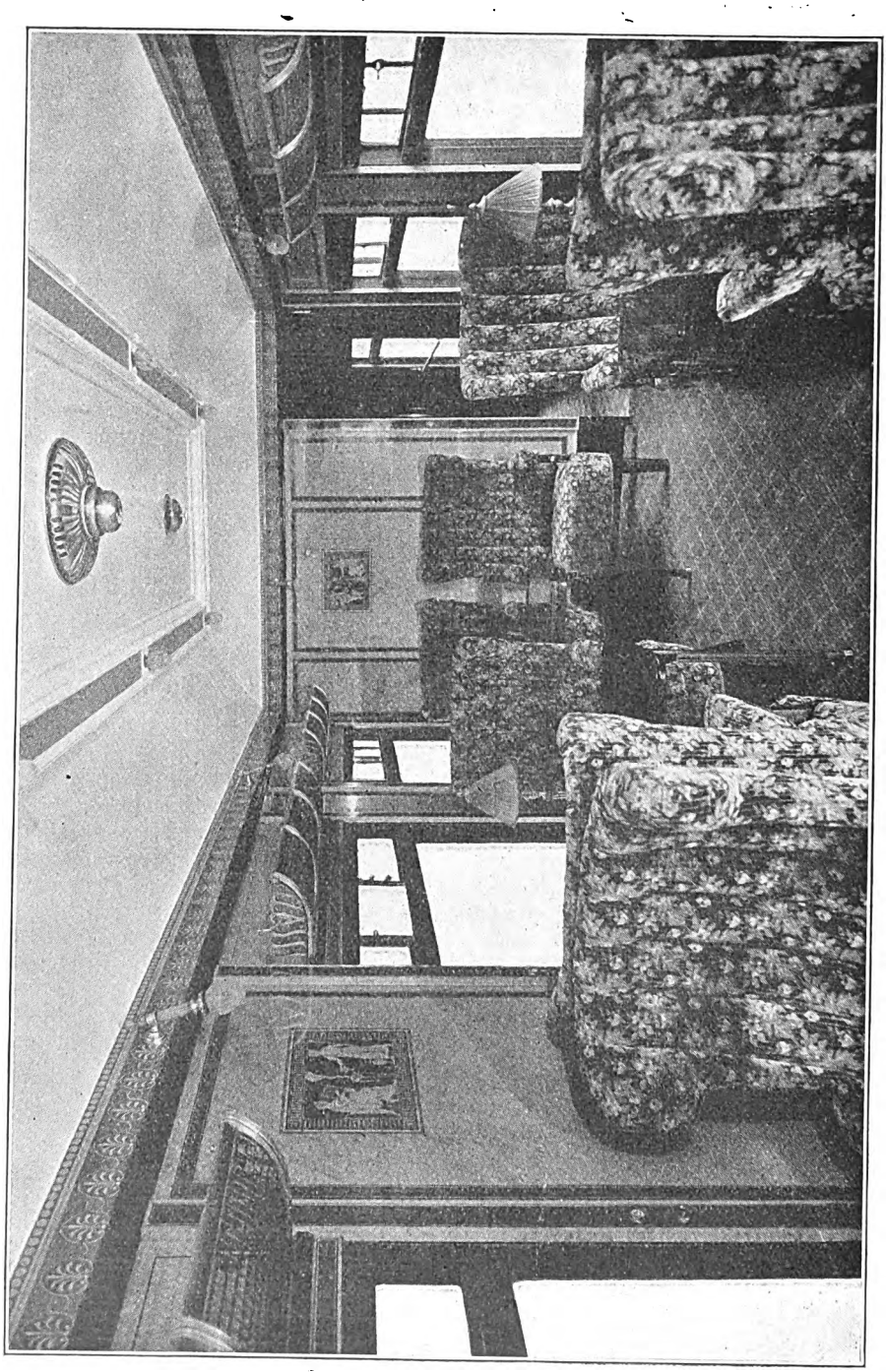

INTERIOR OF NEW PULLMAN CAR "MARJORIE," ONE OF SEVEN FOR DOVER CONTINENTAL SERVICE.

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improved type of high-backed armchair is included, even more comfortable than the seats hitherto provided.

Exteriorly the cars are painted in the familiar umber and cream, relieved with gold lines and scroll decorations, giving a pleasing effect. In this respect there is a return to the standard "Pullman" colours, the cars hitherto used on the South Eastern and Chatham Section of the Southern Railway being painted crimson lake instead of umber and cream as on other lines.

Interiorly the cars are decorated and upholstered according to varied schemes as usual, as will be seen from the following notes as to individual vehicles :—

Aurelia.—Panelling in Cuban mahogany and ebony with marquetry details of Queen Anne period. The ebony decoration in the centre of panels is surrounded by highly-figured mahogany, beautifully quartered. The carpet is green, and the chairs are upholstered in green leather. Gilt fittings.

Marjorie.—Maple veneered panelling with purple band and black line border, and a classic subject in marquetry on the large panels. The pilasters are inlaid with purple bands and black lines, and the cornice inlaid with maple design on purple background. Plum trellis carpet. Floral design moquette on chairs. Silver oxydised fittings.

Medusa.—Shaped head mahogany panels, having "Adams" design marquetry and inlaid frieze rail. The pilasters and cornice are inlaid with light lines. Green trellis carpet and green hide covering on the chairs. Gilt fittings.

Pauline.—Panelling in mahogany with black band and light line border to panels which have floral and ribbon marquetry with oval inlaid medallions bearing a classic figure. The pilasters are inlaid with light lines, and the moulded cornice cross-banded with light and dark lines. Green trellis carpet and light ground floral pattern moquette on chairs. Gilt fittings.

Sappho.—Mahogany panelling with basket of flowers marquetry in upper part with satinwood surround. Inlaid pilasters and the cornice cross-banded with satinwood. Blue trellis carpet and biscuit colour with blue trellis moquette on chairs. Gilt fittings.

Viking.—Mahogany panelling with diamond veneers. The panels are inlaid with swags and wreaths in satinwood with Greek key frieze rail. Blue trellis carpet and blue hide covering on chairs. Gilt fittings.

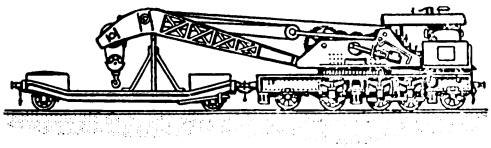
Included in the train is the Pullman luggage and brake van, *Montana*, built to harmonise with the passenger vehicles. The six cars above mentioned accommodate 22 passengers each, the seating being variously arranged, as indicated by the representative seat plan reproduced, to allow for parties travelling together, or in ones or twos.

Leading dimensions are as follows :—

	Ft.	In.
Length over vestibule connections	65	5
,, ,, vestibules ..	63	10
,, ,, corner pillars ..	57	1½
,, ,, headstocks ..	62	4
Centres of bogies	43	4
Bogie wheelbase	10	0
Width inside compartments	7	9½
,, over outside mouldings	8	6
Height from rail to top of roof	12	5
Width over cornice	8	7
Wheels .. .. .. diam.	3	6
Axle journals .. .. ,,	10 in by 5 in.	

The lavatory compartments are finished in polished mahogany throughout, the floors being covered with marbled decolite. A pedestal wash-basin is provided with both hot and cold water supply from Westinghouse heaters. The w.c. hopper is of white porcelain, and two large mirrors are provided on the cross partition.

A kitchen and pantry is provided on each car, and equipped with the usual furnishings, consisting of a large gas-heated range, sinks with hot and cold water supply, cupboards, drawers, &c. The floors of the kitchens and pantries are covered with decolite, and large galvanised steel bins are provided beneath the floors to give extra storage accommodation. Both kitchen and pantry are painted throughout with white enamel, giving a very clean effect. An ice chest is provided in the corridor.



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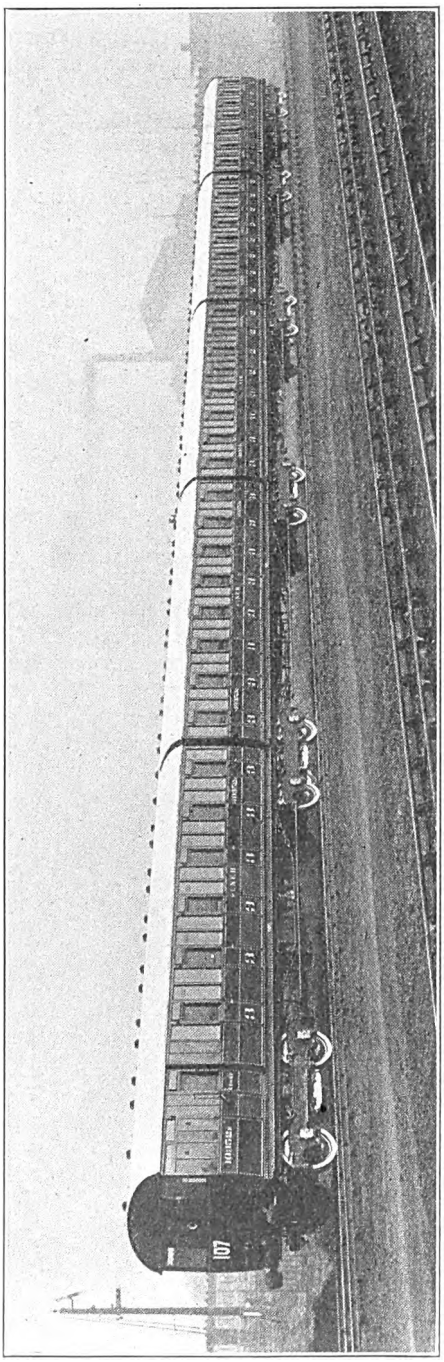
Articulated Suburban Passenger Trains, L.N.E.R.



FIVE-COACH ARTICULATED UNIT SET FOR SUBURBAN TRAFFIC.

AN order was placed some few months back by the directors of the London & North Eastern Railway for 29 complete trains of suburban coaches. The order was divided among the principal carriage builders. The contracting firms were :— The Metropolitan Carriage, Wagon & Finance Co. Ltd. (7 sets), who were the first to make a delivery of the new stock, the Midland Railway Carriage & Wagon Co. Ltd. (5 sets), whose delivery followed that of the Metropolitan Company, and Clayton Wagons Limited (6 sets), who made the third delivery, the other firms being Cravens Railway Carriage & Wagon Co. Ltd., Sheffield (5 sets), Hurst Nelson & Co., Motherwell (3 sets), and R. Y. Pickering & Co. Ltd., Wishaw (3 sets).

A five-coach unit representation of all the trains, but built by Clayton Wagons, Limited, is illustrated.

Each train consists of ten coaches in two units of five coaches, each unit being built on the articulated system, and consisting of one third-class carriage with guard's compartment, one third-class carriage, one second and third-class composite carriage, one second-class carriage, and one first and second-class composite carriage. The complete train seats 872 passengers. These trains are intended for service on the Great Eastern Section. The bogies are of the " Duplex " bolster type standardised for carriage stock on the Great Northern Section of the London & North Eastern Railway. The carriages are fitted with the Westinghouse steam-heating system, Westinghouse brakes, and Stones' electric lighting. A hand brake is also fitted in the guard's compartment.

The carriages are finished outside in varnished teak, and are lined primrose, bordered with a fine red line. The underframes are painted teak colour, and the ironwork details finished in black japan.

The trains have been built to the design and under the supervision of Mr. H. N. Gresley, Chief Mechanical Engineer, London and North Eastern Railway, and represent a first-class example of the latest British practice in design and construction.

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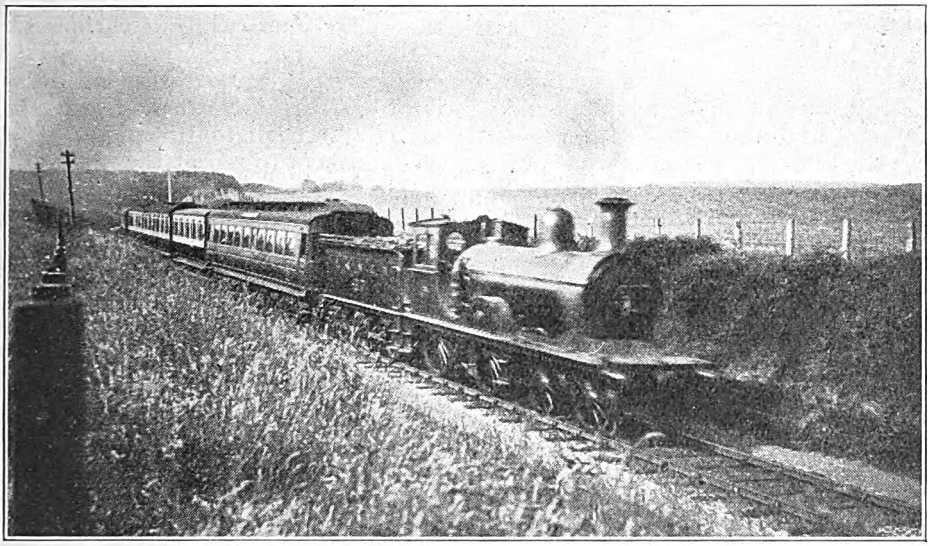

Photo.] [*W. Watt.*

G.N.S. EXPRESS WITH THROUGH CARRIAGES FROM THE SOUTH.

The Great North of Scotland Section of the L.N.E.R.

By J. F. GAIRNS, M.Inst.T., M.I.Loco.E.

As the Great North of Scotland Railway, the system of lines north of Aberdeen, extending to Elgin (by two routes), Banff, Macduff, Fraserburgh, Peterhead, Boddam. and Boat of Garten, together with the Deeside line to Ballater and the Alford, Old Meldrum, and St. Combs branches, had developed a substantial agricultural, fish, and ordinary passenger and tourist traffic, which had caused the railway company, though ranking as a relatively small concern, to be regarded as a progressive, sound, and reasonably profitable undertaking. As an independent railway, the Great North, as it was generally termed, had close relations with both of the two great Scottish companies—the Caledonian and the North British—with which it connected at Aberdeen. The Great North also connected with the old Highland line at various points, the principal junctions being at Keith and Elgin, and although at one period the relations with the latter company were somewhat strained, the through traffic between Inverness and Aberdeen was by no means a small item.

As part of the London and North Eastern, the situation is only in some respects altered, in that necessarily most of the old through traffic and working arrangements with the connecting lines remain as hitherto. Thus, while it is with the North British section of the London and North Eastern Railway that the Great North is associated, by virtue of common ownership and responsibility to the same board of directors and chief officers, the joint ownership of Aberdeen joint station with the London Midland and Scottish Railway and the connections with the Caledonian section of that great system entail the continuance of practically all the old traffic and operating arrangements. Similarly, the fact that the Highland Railway has become a part of the London Midland and Scottish system, and the Great North a section of the London and North Eastern Railway, has not made any material alteration in

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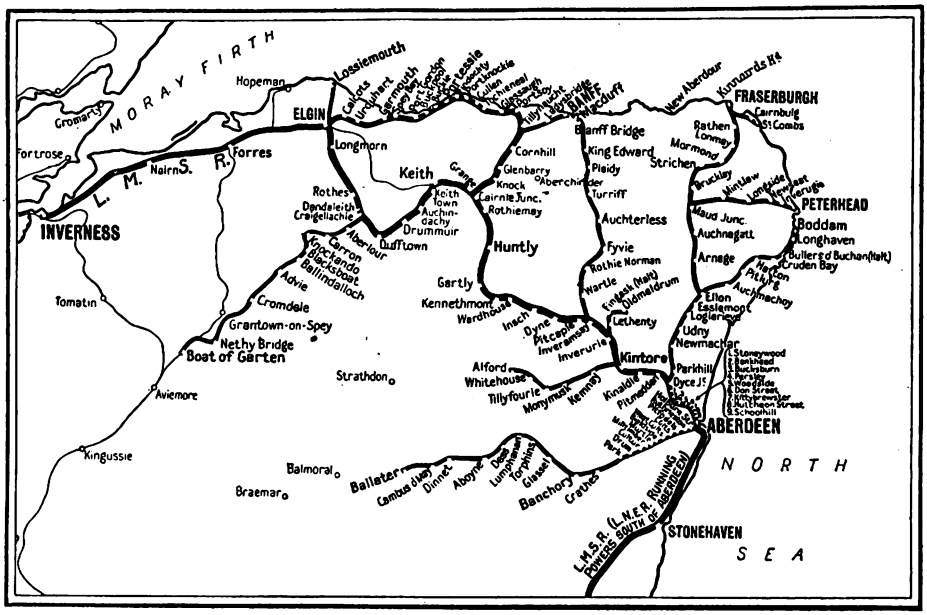
regard to connections at Elgin, Keith, and Boat of Garten.

The Great North system is one possessing many features of interest, as it gives access to numerous places of tourist and historical importance, while there are many features of its traffic and operation which, notwithstanding the attention that has been given to such matters in these pages during recent years, justify further reference to this section of the great East Coast system of which it forms a part.

The Great North of Scotland Railway was originally incorporated as far back as 1846, with a view to the construction of a line from Aberdeen to Inverness, with various branches. Actually, however, the line was not made in this direction beyond Elgin, where connection is effected with what is now the Highland section of the London Midland and Scottish Railway, though between the two routes belonging to the Great North section from Cairnie junction to Elgin there is an intermediate branch of the Highland line to Keith, which thus has a third route from Elgin. Through trains between Aberdeen and Inverness have, however, been run for many years past, each of the companies concerned providing a share of the rolling-stock, while at various periods —though not at present—Highland engines have worked through to Aberdeen and Great North of Scotland locomotives through to Inverness. There is no need here to repeat the general facts of Great North of Scotland history, for which readers may be referred to the "Railway Year Book" and to articles published in the RAILWAY MAGAZINE at various dates.

Although it has terminal platforms for both north and south-bound traffic, Aberdeen joint station requires a number of through lines, in view of the extent to which goods traffic and through vehicles work both north and south, while Great North trains require platform accommodation (terminal or through) both north and south. Moreover, an unusual feature, even for a town of the size of Aberdeen, is the fact that suburban services are operated both north and south of the joint station, in the one case to Dyce, on the main line northwards, and in the other to Culter, along the Deeside line. To these places, distant respectively 6¼ and 7½ miles from the joint station, intermediate stations are provided in close series, there being, in fact, no fewer than nine between the joint station and Dyce



MAP OF GREAT NORTH OF SCOTLAND SECTION, L.N.E.R.

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and eight between the former and Culter. While, to some extent, development of the Aberdeen tramways and motor 'bus services has cut into the railway traffic, the fact remains that the construction of these close series of stations and the provision of reasonably frequent trains—particularly at the hours of business travel—have created a considerable residential population along these routes. The local trains are usually worked by 0-4-4 tank engines, with series of 6-12 four or six-wheeled vehicles. In addition, many of the through trains call at the more important suburban stations, so that, in the aggregate, relatively plentiful facilities are provided.

Dealing first with the Deeside line, there are four trains each way daily serving all stations (beyond Culter) between Aberdeen and Ballater; morning and evening fast trains from Ballater to Aberdeen; a down express from Aberdeen to Ballater, 12.20 p.m.; one at 1.40 p.m. on Saturdays and at 4.40 p.m. on other weekdays; and three trains in each direction between Aberdeen and Banchory. There are thus nine trains serving all or certain stations beyond Culter, of every one of which the favourite district of Banchory has the benefit.

The line beyond Park is single track, and the engines are fitted with tablet-exchanging apparatus, so that non-stopping trains do not require to reduce speed at intermediate stations. Some of the through down trains drop vehicles at Banchory, taking them on again when returning, in view of the heavier demand for accommodation between Aberdeen and Banchory, though during the summer months the loads worked through to Ballater are often considerable for the relatively small 4-4-0 locomotives employed. On Wednesdays and Saturdays additional trains are frequently run for excursion passengers and to meet the demands of the ordinary summer traffic.

Speaking generally, the Deeside line follows the valley of the Dee, and in many places gives splendid views of Deeside scenery. In fact, as the railway winds its way up the valley towards Ballater, and the mountains close in, it justifies in every way its description as one of the most beautiful of Scottish lines, though in a quieter way than some of those which are characterised by more sensational scenic surroundings. Leaving Culter, the stations of Drum, Park, and Crathes serve picturesque sections of the Dee valley. Banchory ranks as the most popular resort on lower Deeside, and is quite a substantial town, with hotels, fishing, golfing, and other facilities amply provided, while it is a convenient centre for many attractive local excursions.

Continuing past Glassel, Torphins, Lumphanan and Dess, Aboyne, another very popular resort on Deeside, is reached. Here also are many fine villa residences and facilities for tourists, while the station is a splendid starting-point for excursions over the moorland adjacent or among the hills and mountains which are within easy reach. One of the famous Highland gatherings is held here annually, usually in September. Dinnet, the next station, is, however, the great moorland centre for this district, the railway traversing the Moor of Dinnet for a considerable distance, the scene in autumn, when the heather is in bloom, being singularly beautiful.

Although it was at one time intended to extend the railway from its present terminus at Ballater to Braemar—and a short section of line beyond the former station was actually constructed—it has not so far proved practicable to give Braemar, "the capital of the Deeside Highlands," connection by rail. Ballater itself, a splendid centre for this district, is a fair-sized town, and is of importance as "the gateway to the Deeside Highlands." While Braemar, together with the village of Crathie and the Balmoral estate, does not enjoy direct railway facilities, the railway company has for many years past provided in place thereof a sufficient service of motor omnibuses (supplemented by motor charabancs in summer), giving connection with three of the six trains in each direction between Aberdeen and Ballater. The vehicles employed also provide for the conveyance of luggage and ordinary parcels and similar traffic. Incidentally, the journeys they make, especially during the summer months when the motor charabancs are in use, are interesting from end to end, particularly when passing Crathie Church and Balmoral Castle, and when approaching Braemar, a village at an altitude of

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1,114 ft. and entirely surrounded by the Cairngorm mountains, which include six of the seven highest summits in Great Britain. As Braemar is a centre for many attractive excursions, and is a lovely little place in itself, it is not surprising that it is visited by tourists in very large numbers, and that it constitutes the headquarters of not a few holiday-makers.

Travelling northwards from Aberdeen, Dyce is the junction station for the group of lines leading to Cruden Bay, and Boddam, Peterhead, and Fraserburgh. Trains for each of these routes use the same metals as far as Ellon, and to a great extent are operated as combined trains thus far. The 6.48 a.m. from Aberdeen is a combined Peterhead and Fraserburgh train, the 8.30 a.m. express is similarly constituted, with, in addition, a connection from Ellon to Cruden Bay, while the 10 a.m., 12.43, 4.25 and 7 p.m. trains similarly have Peterhead and Fraserburgh sections, with connections and in some cases through carriages from Aberdeen to Boddam. Corresponding arrangements are made in the up direction, except that the 9.30 a.m. from Peterhead (9.20 a.m. from Fraserburgh) has a connection from Cruden Bay only and not from Boddam, as in the case of other trains. The Peterhead and Fraserburgh sections are separated at Maud junction, 12 miles beyond Ellon.

Except for Cruden Bay, there is not much of tourist and holiday interest attaching to any of these lines, the country served being mainly agricultural. Fraserburgh is, however, the great centre of the Scottish herring industry, and a substantial town in a small way. It is situated at the entrance to the Moray Firth, near the rocky promontory of Kinnaird Head crowned by its lighthouse and ancient castle. The harbour is extensive, and during the fishing season often crowded to its fullest capacity. There are fine sands adjacent, while the coast near by is rugged and picturesque. The railway yard is necessarily large in view of the extent of the fish traffic, which requires the loading of many vehicles, and frequently their running in special fast fish trains through not only to various parts of Scotland, but also to England and to the London markets. Peterhead, the most easterly town in Scotland, has greater claims as a holiday and tourist resort, while it is also one of the leading fishing ports in Scotland. The town is built largely of red granite from the quarries near by, while not far away is the famous convict prison.

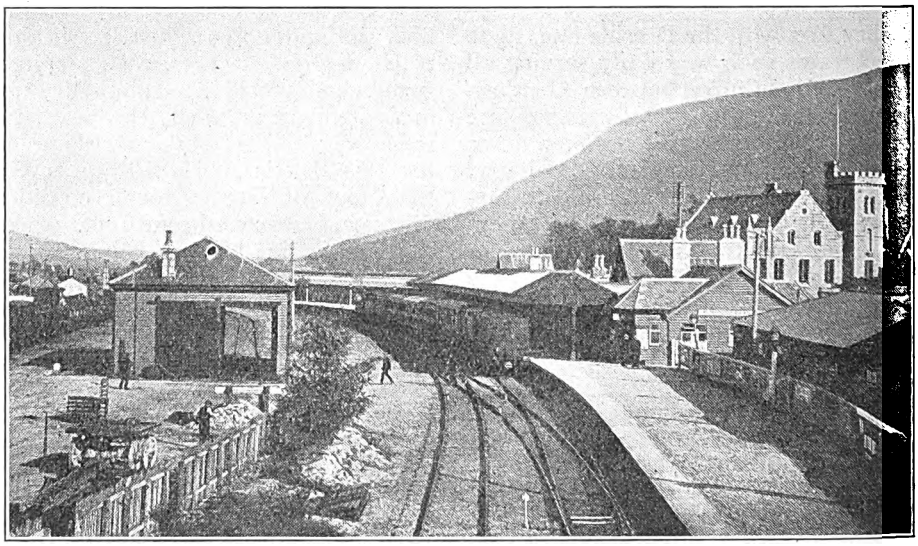

Photo.] BALLATER STATION. [*J. F. Gairns.*

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To the tourist, and particularly to the follower of the "Royal and Ancient Game of Golf," Cruden Bay is the principal station in this part of the district served by the Great North of Scotland system. Cruden Bay is in the heart of the most picturesque part of the Buchan coast, noted for its precipitous cliffs and numerous caves. The bay itself has a crescent of silver sands two miles long, behind which are the famous Cruden Bay golf links. A modern hotel quite close to the golf course and overlooking the bay and sands was erected several years ago by the railway company, and an electric tramway is provided to convey passengers between the railway station and the hotel, a distance of about half a mile.

Before leaving this group of lines reference may be made to the short branch from Fraserburgh to St. Combs. Some years ago a steam rail motor car was introduced for working on this branch, and at another period a four-wheeled tank engine was used. An ordinary 0-4-4 tank engine is now employed. The branch is operated as a light railway, and was opened in 1903.

Returning to the main line at Dyce, the next junction is at Kintore, whence the Alford branch diverges. Alford is rapidly growing in favour as a health resort and as a centre for exploring the surrounding district. It is also the starting-point for the railway motor 'buses which run daily to Strathdon, as described in greater detail later. The next station, Inverurie, serves a town of growing importance, particularly in view of the fact that here are located the locomotive, carriage and wagon works of the Great North of Scotland section. When the works were removed from Kittybrewster to Inverurie, some 25 years ago, the new premises were laid out to permit of considerable extensions, and they are well designed and equipped on modern lines. It is probable that as the years go on they will be developed to serve the needs not only of the Great North of Scotland section, but, to some extent, of the whole of the Scottish area of the London and North Eastern Railway. The town is one which is rapidly growing in favour as a residential centre; also as a holiday resort providing convenient access to many districts of considerable interest. The station is a junction for the branch to Old Meldrum, one dating from early years, in that, together with the Alford Valley line, it was incorporated in the Great North of Scotland system as long ago as August, 1866.

The next station, Inveramsay, is also a junction, the comparatively lengthy

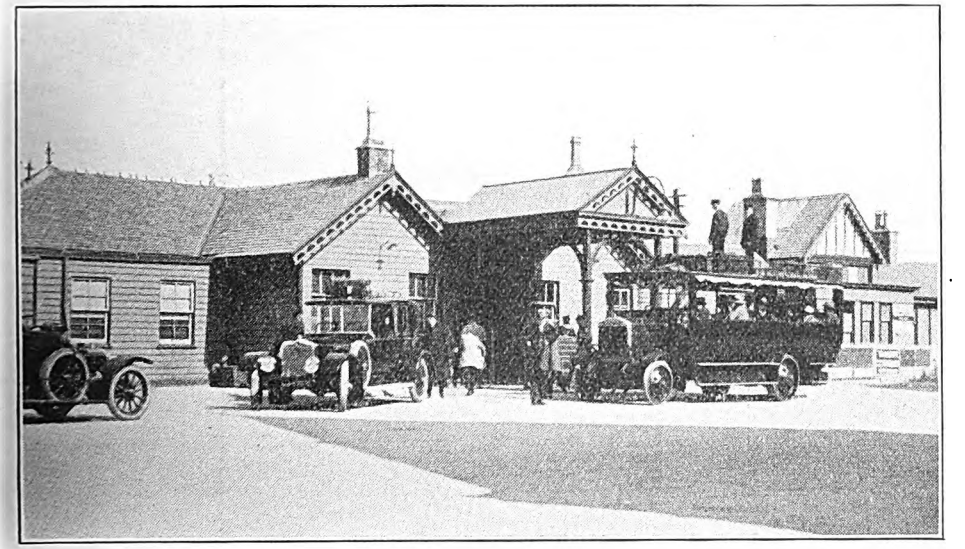

Photo.] [*J. F. Gairns.*

G.N.S.R. MOTOR-CHARABANC OUTSIDE BALLATER STATION.

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branch to Banff Bridge and Macduff here leaving the main line to proceed directly north to the coast. In its length of 29¾ miles, over which a service of five trains in each direction is run daily, there are eight intermediate stations, the principal being Fyvie and Turriff. Banff Bridge and Macduff, together with a branch from the main line at Tillynaught to the Harbour station at Banff, serve the communities of Banff and Macduff. Banff is the capital of the county, an ancient Royal Burgh, overlooking the Moray Firth, at the mouth of the Deveron. It has also a harbour, served more particularly by the branch from Tillynaught, and is the centre of a substantial fishing traffic. Macduff ranks as a popular seaside resort, adjacent to which there is much picturesque coastal scenery. The two stations at Banff are about a mile apart.

Leaving Inveramsay junction again *via* the main line, the stations of Pitcaple, Oyne, Insch, Wardhouse, Kennethmont, and Gartly are passed, and the town of Huntly, 40 miles from Aberdeen, reached. This is the largest inland town in Aberdeenshire, and in the case of the 7.45 a.m. from Aberdeen is the first stop, the very creditable time of 58 minutes being allowed for the run of 40 miles, with gradients which are far from insignificant. Near Huntly are the ruins of Huntly Castle, while the town itself constitutes a convenient holiday centre, not the least important of its facilities being the railway motor 'buses plying between Huntly and Aberchirder.

Seven and a half miles beyond Huntly, and passing the intermediate station of Rothiemay, Cairnie junction is reached. This is described as an exchange platform only, in that passengers are not booked to or from it, its purpose being to provide for the separation of down and the combination of up trains, and for interchange passenger traffic between up and down trains. North of the junction a triangle is laid out, so that trains can be run from one section to the other, but most trains include sections for each route to Elgin, though, in some instances, connections are made at Keith or Grange, instead of at Cairnie junction. The inland route to Elgin, *via* Keith, is some seven miles shorter than that *via* the coast, and most of the fast trains take that route, though this is due not so much to the shorter distance as to the fact that by travelling that way they are able to serve the town of Keith and connect at Craigallachie with the Speyside line to Grantown and Boat of Garten. Between Cairnie junction and Keith there is one intermediate station,

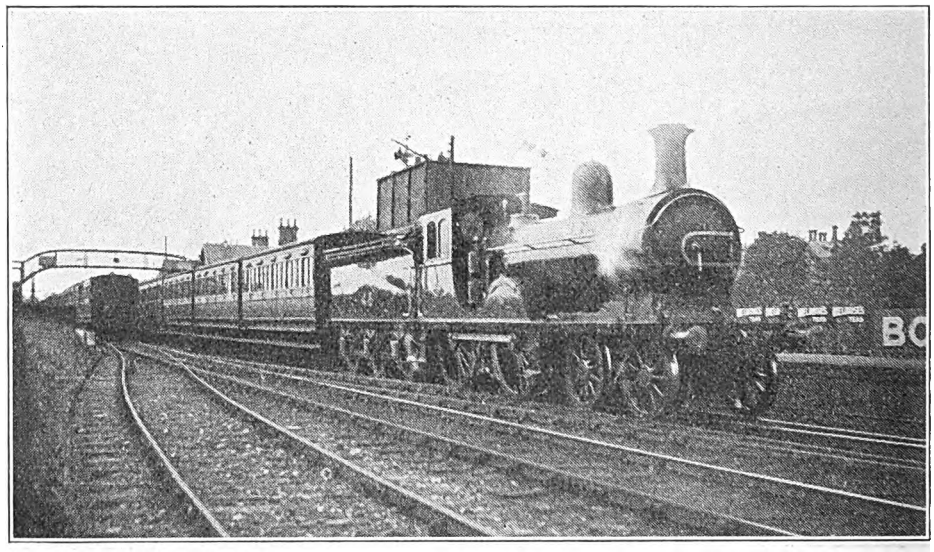

Photo.] [*W. Watt.*

INVERNESS-ABERDEEN EXPRESS IN ELGIN (HIGHLAND) STATION.

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Grange. The station at Keith is actually a terminus, into which Great North of Scotland trains work both north and south. It is also used by London Midland and Scottish Railway trains from the Highland section, which here connects with the Great North of Scotland section of the London and North Eastern Railway. Certain trains, however, pass this station and call instead at Keith Town station. The town of Keith is one of considerable importance in the locality, and has many attractions for tourists.

Ten miles beyond Keith Town, passing the intermediate stations of Auchindachy and Drummuir, Dufftown—said to be in the heart of the "whisky country"—is reached. It is an up-to-date town amid beautiful surroundings, and therefore in considerable favour among tourists. Four miles farther on, Craigellachie junction is reached. From here the Speyside branch proceeds in a south-westerly direction past Aberlour, Carron and Knockando to Blacksboat and Ballindalloch, and onwards *via* Advie and Cromdale to Grantown, Nethy Bridge, and Boat of Garten. This branch, 33¼ miles in length, is claimed to be probably the most scenic of all sections of the Great North of Scotland line, its only rival in this respect being the Deeside section. Both include somewhat similar characteristics, in that each serves exceptionally picturesque Highland mountain districts, though their respective features present marked differences. Ballindalloch station is, it may be pointed out, a centre for motor omnibus services to Tomintoul, a stage in the well-known "Three Rivers Tour," to which further reference will be made later.

From Craigellachie junction northwards to Elgin the stations served are Rothes, a principal centre of the Speyside whisky industry, Birchfield, Coleburn, and Longmorn. At Elgin connection is made with the alternative route from Cairnie junction *via* the coast, the branch of Lossiemouth, and the Highland section of the London Midland and Scottish Railway, by which communication with Inverness is completed. Returning to Cairnie junction, and passing Knock, Glenbarry, and Cornhill, Tillynaught junction is reached. Branch trains leave the junction to serve Banff Harbour, as already mentioned, Elgin trains proceeding direct along the coast *via* Portsoy. Thence for some 17 miles the coast is closely followed, in order to serve a succession of fishing towns and villages. Nearly every one of these stations is, in fact, to some extent a fishing centre, though, in this respect, Buckie, which has an extensive and well-pro-

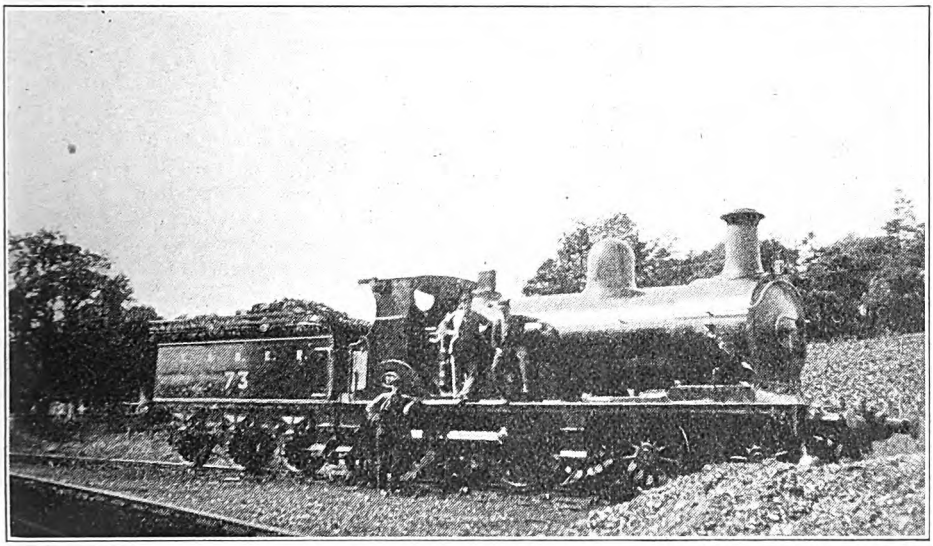

Photo.] [*K. Arnott.*

L.N.E. (G.N. OF S.) 4-4-0 LOCOMOTIVE No. 73 AT BANCHORY.

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tected harbour, takes the lead, ranking with Peterhead and other great fishing centres along the coast from Aberdeen to Lossiemouth. Cullen, Portknockie, Findochty and Portessie may be particularly mentioned in association with Buckie in this connection. Spey Bay, at one time known as Fochabers-on-Spey, has come to be regarded as a leading seaside resort, although this distinction is shared, to some extent, by most of the stations concerned.

Nearing Elgin, the branch from Lossiemouth, serving the ancient fishing villages of Old Lossie and Seatown, the village of Branderburgh, and the residential district of Stotfield—which together constitute the modern holiday resort and fishing town of Lossiemouth—makes connection with the coast main line. Nearer the station at Elgin the inland route from Keith, previously described, comes in, all these lines thus having access to the well-designed and relatively modern station provided by the Great North of Scotland Railway to serve the cathedral city of Elgin, the county town of Moray. The station includes one long main through platform, and, at the east end, two terminal platforms used by branch and connecting trains. The station itself is provided with refreshment and dining rooms and other travel conveniences. Alongside the through platform are additional tracks, together with goods yard and engine sheds, and beyond is the Highland (L.M.S.) station. Through vehicles are usually transferred from the G.N.S. to the Highland station, or *vice versa*, for combining with or separating from, coaches which do not proceed through, in cases where the whole of the train is not taken.

The chief main line services are the 4.35 a.m. from Aberdeen, calling at principal stations only to Keith, and providing an L.M.S. connection thence to Inverness, besides connecting with the 6.50 a.m. stopping train from Keith to Elgin, *via* the coast line, and the 7.10 a.m. to Elgin, *via* Craigellachie; the 6.33 a.m. stopping train from Aberdeen to Keith; the 7.45 a.m. restaurant car express for Inverness, conveying also a King's Cross–Lossiemouth sleeping car and through carriage, this train being booked non-stop to Huntly and thence serving principal stations only to Elgin *via* Craigellachie; the 8.5 a.m. from Aberdeen, semi-fast to Elgin, *via* Craigellachie, detaching a section for the coast line at Cairnie junction; the 9.45 a.m. combined train for Elgin, the respective sections being divided at Cairnie junction; the 2.20 p.m. express train *via* Craigellachie, with through

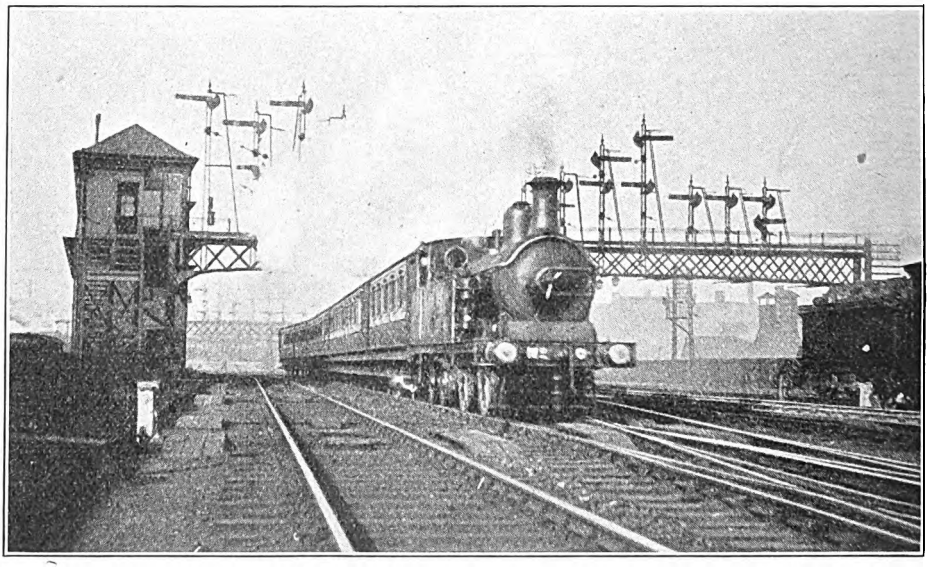

Photo.] [*J. F. Gairns.*

DEESIDE LINE SUBURBAN TRAIN LEAVING ABERDEEN JOINT STATION.

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carriages for Inverness, and conveying vehicles for Lossiemouth by the 10.15 a.m. from Edinburgh (Waverley); the 3.30 p.m. combined train, divided at Cairnie junction; and the 6.45 p.m. express train to Elgin, *via* the coast line. In addition to Macduff and other branch trains serving main line stations as far as the respective junctions, mention may also be made of the 5.45 p.m. from Aberdeen, running as far as Cairnie junction, this providing a connection for Grange and Keith with the 6.45 p.m. from Aberdeen.

In the opposite direction the principal through trains are the 9.32 a.m. from Elgin, *via* the coast line, conveying a through carriage for Edinburgh (Waverley), and the 9.35 a.m. from Elgin, *via* Craigellachie, the two sections being combined at Cairnie junction; the 2.20 p.m. from Elgin, *via* Craigellachie, and the 2.25 p.m., *via* the coast line, conveying a restaurant car and through carriages from Inverness to Aberdeen, these also being combined at Cairnie junction; the 4.30 p.m. from Elgin, *via* Craigellachie, conveying the sleeping car and through carriage from Lossiemouth to King's Cross; and the 7.35 p.m. from Elgin, *via* the coast line. also with through carriages from Inverness to Aberdeen; together with the 6.10 a.m. and 12.15, 3.25 and 5.55 p.m. coast line trains, and the 6.40 a.m. and 5.50 p.m, trains *via* Craigellachie. There are also trains from Keith at 6.20 and 8.40 a.m., and at 1.3 p.m. On the Speyside line there are three trains from Craigellachie to Boat of Garten, and one as far as Ballindalloch, and four trains from Boat of Garten to Craigellachie. In most cases where trains are divided or combined at Cairnie junction a connection with the coast line section is run from or to Keith. The Lossiemouth branch has the generous service of ten trains daily in each direction, making connections with main line trains at Elgin on both routes.

In passing it may be mentioned that all the train services above referred to are those in operation during the summer months, considerable alterations being made in the winter services, as in other parts of the country.

While the Great North of Scotland section is, as a rule, fairly heavily graded, particularly on those sections which penetrate the more mountainous districts, it has relatively few works of special engineering interest. It has, however, one exceptionally notable bridge—that over the River Spey on the coast line. This is 950 ft. in length, with a main span of 350 ft., the remaining six being about 100 ft. each. It is thus a remarkable structure of its kind. So far as stations are concerned, Aberdeen Joint (described in the RAILWAY MAGAZINE for January, 1921) is necessarily by far the most important. Banchory and one or two other stations on the Deeside line are, however, good examples of modern station construction, while Elgin is an essentially up-to-date structure, with all the facilities and conveniences which one would expect to find at so important a traffic centre. The only tunnels of note are the two between Schoolhill and Hutcheon Street, Aberdeen, which are 230 and 270 yards in length. The summit level is, between Nethy Bridge and Boat of Garten, 702 ft. above sea level.

The Great North of Scotland section is, of course, included in many elaborate tourist arrangements in force both within the limits of the London and North Eastern Railway and in conjunction with the London Midland and Scottish Railway. Thus, tourist tickets for Inverness can be routed *via* London and North Eastern Railway throughout to Elgin, with return facilities by the L.M.S. line *via* Inverness to Perth, or alternatively *via* Forres and Grantown-on-Spey or *via* Speyside line and Boat of Garten. There are also many tourist facilities covering varied routes within the limits of the London and North Eastern Railway. Many local tourist excursions are also arranged for utilising the Great North of Scotland section motor omnibus services as described later. Others of a more elaborate character include also steamer services on the Caledonian and Crinan Canals as far as Fort William, and even Oban.

A special feature of the Great North of Scotland is the very generous basis on which day excursion facilities are provided from Aberdeen in all directions. Some of these excursions are suitable for half-day trips, and many are provided on Wednesdays and Saturdays only. On each day of the week, however, there is a considerable choice, and during the season special fast trains are frequently

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scheduled on the Deeside and Speyside lines. Some of these excursion trains rank as the fastest and most notable operated anywhere on the system, in that, as through trains for particular groups of stations, there is no need to provide for intermediate requirements, as in the case of the ordinary trains. As a result, there are trains for the Speyside line running non-stop to Dufftown, operated, moreover, in view of the distance, at average speeds which entitle these excursion trains to rank as through expresses. There is thus a wide variety of cheap and convenient tours, both day and half-day, available for holiday-makers temporarily domiciled in Aberdeen or in other places on the Great North of Scotland section.

There are also various round tours utilising rail and road facilities. Of these the most notable of all is the famous "Three Rivers Tour," including rail, motor and coach, and traversing some of the most picturesque parts of Deeside, Donside, and Speyside. This tour is not intended to be made continuously, and, in any case, requires two days. The journey is from Aberdeen to Dinnet or Ballater *via* rail, motor thence to Strathdon and Corgarff, coach from there to Tomintoul, motor from Tomintoul to Ballindalloch, and return *via* rail to Aberdeen. This tour can also be made in the opposite direction. A shortened variation, which can be covered in one day, is by rail from Aberdeen to Dinnet, motor thence to Strathdon, another motor from Strathdon to Alford, and by rail back to Aberdeen. In the opposite direction Ballater can be included. A further variation includes the northern part of the "Three Rivers Tour," commencing by rail from Aberdeen to Alford, and motor thence to Strathdon and Corgarff, to pick up the coach thence to Tomintoul, motor from Tomintoul to Ballindalloch, and rail back to Aberdeen. One of the most popular tours is, however, that to Ballater and Braemar—rail from Aberdeen to Ballater, and road motor between Ballater and Braemar, passing Crathie and Balmoral. The incidental stages of the "Three Rivers" and other tours are also popular for tourist purposes, notably the services between Ballater, Dinnet, and Strathdon, from Alford to Strathdon, and between Ballindalloch and Tomintoul. Other road services operated by the Great North of Scotland section, such as those between Huntly and Aberchirder, Fraserburgh, Rosehearty and New Aberdour, and from Aberdeen (Schoolhill station) and Skene, Dunecht and Cluny, are designed more particularly to provide transport facilities between the places in question, though some of these are also in considerable favour among tourists.

The Great North of Scotland section provides, in addition, for the convenience of holiday-makers and tourists generally, in that the Palace Hotel at Aberdeen, owned by the company, ranks as the leading hotel in the "Granite City," and is particularly convenient for travellers breaking their journeys or desiring to take advantage of the many tourist and other facilities for which Aberdeen is so convenient a centre, while at Cruden Bay the railway hotel is largely utilised both by golfers and general tourists and holiday-makers.

While the Great North of Scotland section is not the scene of merchandise or other freight traffic on an exceptional scale, all routes provide a considerable amount of agricultural traffic, including a very heavy dead-meat traffic to London and other large consuming centres, while the Peterhead, Fraserburgh and Moray Firth coast lines carry, during the seasons, fish traffic on a very large scale, much of it conveyed, moreover, in fast fish specials.

This aspect received special attention in an article published in the January, 1923, number of the RAILWAY MAGAZINE.

While in early days methods and traffic conditions on the Great North of Scotland Railway included some "peculiar" features, if one may judge from some of the remarks passed by Mr. E. L. Ahrons when dealing with the Great North of Scotland Railway in early days (*see* RAILWAY MAGAZINE for January, 1922), for many years prior to its incorporation in the London and North Eastern Railway it ranked as an efficiently managed and distinctly creditable system of the medium class. Thus, while it had no locomotives of types calling for special remark, its standard 4-4-0 "universal" engines proved themselves capable of doing notable work on occasions, and of performing ordinary

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duties, including the operation of express and stopping passenger, or fast and slow goods trains, with general satisfaction. Similarly, the rolling-stock has for long been noted for its general convenience and cleanliness, while modern stock has included a considerable proportion of bogie vehicles, many of corridor type, and with all usual conveniences of travel. The introduction of restaurant cars on certain services, though a recent development, has fully justified itself. The single-track lines are controlled by electric train tablet apparatus, while the system of exchanging tablets at speed, almost universally provided for on the Great North of Scotland section, and largely used also on other lines, was originated to meet the needs of Great North of Scotland traffic.

Finally, it may be mentioned that the Great North of Scotland section is still operated, to some extent, as a distinct part of the London and North Eastern system, in that, under the title of "Northern Scottish Area," it has several officers who are still concerned mainly, if not exclusively, with its operation. Thus, traffic working is under the charge of Mr. William Johnston as Traffic Superintendent, Mr. J. A. Parker is responsible for the engineering work, while the hotels are under Mr. A. A. Ryan as Hotels Manager.

GLASGOW EXPRESS LEAVING WEMYSS BAY.

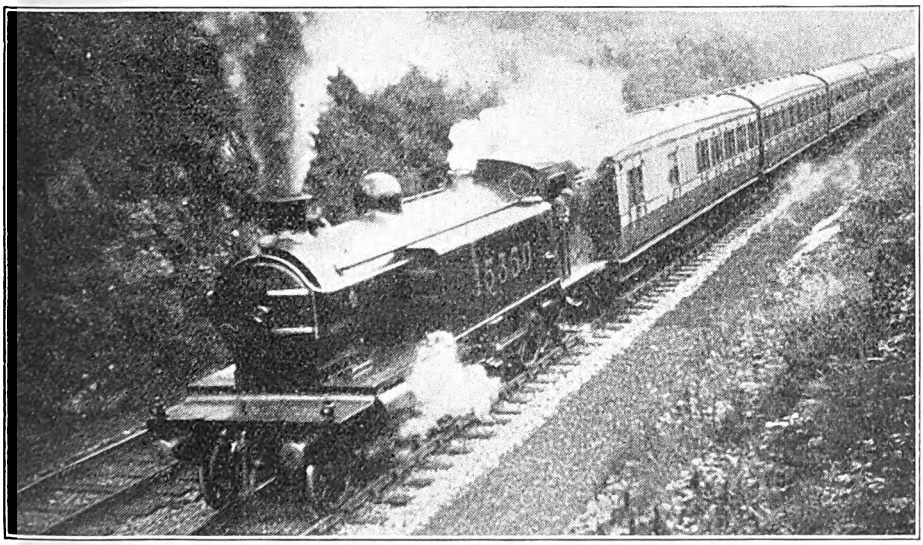

Photo.] [*C. J. L. Romanes.*

L.M.S. 4-6-2 Tank Engine No. 15350.

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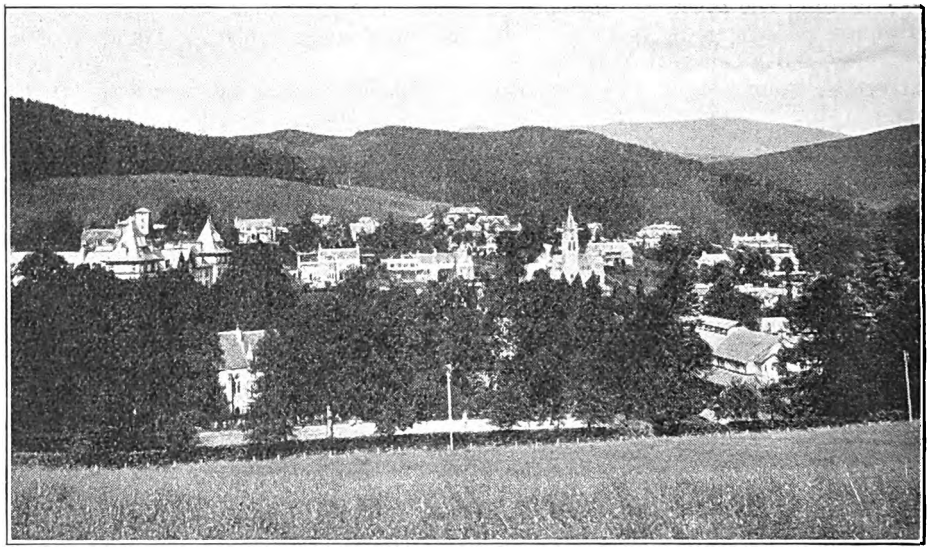

GENERAL VIEW OF STRATHPEFFER SPA.

The Dingwall and Skye Line, L.M.S.R.

By H. R. STONES.

THIS line, traversing the county of Ross-shire from coast to coast, may well be considered to rank among the wildest and most picturesque lines in the British Isles. The country through which it passes is extremely rugged, and great difficulties were experienced in its construction, which is estimated to have cost about £500,000. As the population is very sparse in these "Far North Highlands," the traveller will find very few houses, except in the neighbourhood of stations, and many of these are the property of the railway company, and are inhabited by the company's employees, though, in the aggregate, a fair population may be served, as most stations are centres for very wide areas. A great variety of scenery of surpassing beauty is one of the chief features of the line, and for this alone the journey is well worth making, apart from interest in other connections.

Opened in the year 1870, from Dingwall to Stromeferry, a distance of 53 miles, the Dingwall and Skye Railway, as it was then known, became amalgamated with the late Highland Railway Company during the year 1880. In 1893, Parliamentary powers were obtained to extend the then existing line from Stromeferry, which up to this period had been the westernmost terminus, to the Kyle of Lochalsh, on the extreme west coast of Ross-shire, a distance of 10½ miles. This latter section was, from an engineering point of view, the most difficult and costly to construct. The high mountains surrounding the western coast necessitated the line following the southern shore of Loch Carron to its present terminus. Owing to the coast being very indented, the line curves in and out in a most remarkable fashion, and runs through some very steep rock cuttings, whose sides in many cases rise perpendicularly to heights of 70 ft. The views obtained from the train between Stromeferry and the Kyle of Lochalsh are particularly fine.

The Skye line leaves the northern main line of the Highland section at Dingwall, the county town of Ross-shire, which is

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situated in a good position at the foot of the Cromarty Firth. Dingwall is also the junction for the popular northern spa of Strathpeffer, which is situated some 4¾ miles away in the picturesque valley, at the foot of lofty Ben Wyvis. The railway company have constructed an excellent hotel at Strathpeffer, and during the summer months the hotel is well patronised by visitors from all parts of Great Britain. The station at Dingwall has three through platforms, the Strathpeffer trains being accommodated in a short bay platform alongside the north end of the down platform. The up platform is an island, with two through lines. The station buildings are of the standard pattern in use on the Highland section of the L.M. & S.R., and include a good refreshment room.

Leaving Dingwall on the north side, the Skye line leaves the main line and bends sharply to the west, and runs along the north side of the town. At Fodderty Junction, some 2¼ miles from Dingwall, the Strathpeffer branch strikes off. After leaving the junction, the Skye line rapidly rises through wooded hills, and passes along the northern slope of the valley, overlooking Strathpeffer, to Achterneed station, which commands a really magnificent view of the spa in the valley below. Strathpeffer is very picturesquely situated, being surrounded on all sides by lofty mountains, some of their peaks snow-clad all through the year. Masses of broom usually cover the slopes of the valley on either side. Broom grows very profusely along the Skye line, and this, together with the purple heather, adds additional colouring to the fine scenery.

Continuing on from Achterneed the line crosses the River Peffrey, and runs through a picturesque gorge, surmounted by a lofty precipitous mass, known as the "Raven Rock" and skirts along the southern wooded shores of wild but beautiful Loch Garve to Garve station, situated at the western end of the loch. There is an excellent hotel in close proximity to the station, and visitors have the privilege of fishing in the loch adjoining. There is a daily mail-car connection between Garve, Loch Broom, and Ullapool.

After leaving Garve there is little of interest to be seen until the line reaches Loch Luichart, famous for its trout fishing. The whole of the loch is not visible from the train, but travellers can fully appreciate its beauties and the lofty mountains which surround it. Loch Luichart station lies near the head of the loch. Just beyond the station the beautiful Falls of Grudie are passed on the north side of the line; attention being generally attracted by the sound of the rushing and foaming waters. The line next enters "Strath Bran," or the "Valley of the Drizzle," and reaches the isolated station of Achanalt. From this point to Achnasheen, the next station, the scenery is very wild and bleak, but there is an occasional lonely loch or a forest of pine to relieve the monotony. Achnasheen, standing at the head of "Strath Bran," is 27 miles from Dingwall, and is one of the important stations on the Skye line. There is a good refreshment room on the station, and there is also an hotel adjoining. Passengers alight at Achnasheen for Gairloch and Loch Maree; being conveyed thence by mail motor-coach, which runs daily in connection with the midday train from Inverness.

Leaving Achnasheen the railway crosses the River Bran and soon reaches the shores of Loch Gowan, in the middle of some very wild moorland scenery. About a mile from the loch the highest point on the railway is reached, being 644 ft. above sea level. The journey up to this is comparatively slow, owing to the heavy gradients which the train has to ascend. The gradient now falls rapidly, and Loch Scavan, with its wooded islets, is passed. After passing Glencarron platform, a halt, the line enters the picturesque valley of the Carron, and Achnashellach station is reached. This station stands on the shores of Loch Doughal, and is surrounded by a great variety of forest and mountain scenery. In the writer's opinion, Achnashellach is one of the most picturesque stations on the Skye line. Continuing on through the Valley of the Carron, the next station reached is Strathcarron, situated at the head of Loch Carron (an inland salt-water lake), which runs out into the Inner Sound of Raasey. Visitors to Loch Torridon alight at Strathcarron, which is also within easy reach of several other places of interest in the district. The line now follows the southern shore of Loch Carron, and after passing Attadale halt reaches Stromeferry, which up to 1897 was the terminus of the line.

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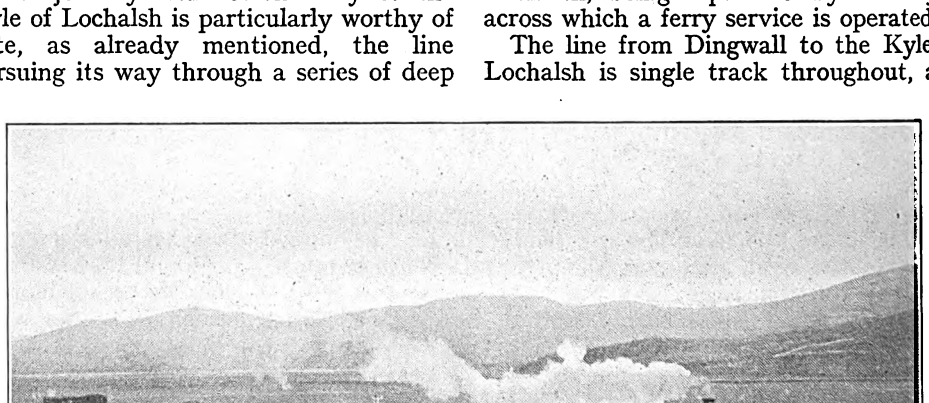
Before the line was extended, Stromeferry station possessed only a single platform, but since the extension to the Kyle of Lochalsh the line through the station has been doubled and another platform erected. The extension of the line has undoubtedly been responsible for Stromeferry losing its importance as a port of call for the Hebridean boats, and at the present time only occasional calls are made.

The journey from Stromeferry to the Kyle of Lochalsh is particularly worthy of note, as already mentioned, the line pursuing its way through a series of deep and rugged rock cuttings. Turning to the east side of the railway there is an ever-changing picture of beautiful mountains and lochs, while in the west the lofty mountains of Skye become visible. Among them are the famous Coolin Mountains, many of these being over 3,000 ft. in height. Following the southern shore of Loch Carron, stations are passed at Plockton and Duirinish. Plockton is a growing hamlet, and a favourite resort for many people who wish to take a quiet holiday on the west coast of Scotland. All westbound trains call at Plockton, where tickets are collected. Soon after leaving Duirinish, the quaint little Highland village of Erbusaig will be seen on the left side of the railway. The village, with its crofters' cottages, lies quite close to the line. From this point the railway makes several bends and counter bends, and after passing through a further series of rock cuttings in quick succession reaches the Kyle of Lochalsh, the western terminus of the line, 82 miles from Inverness and 64 miles from Dingwall. The Island of Skye is within half a mile of the Kyle of Lochalsh, being separated by the Kyle, across which a ferry service is operated.

The line from Dingwall to the Kyle of Lochalsh is single track throughout, and is worked on the Tyers train tablet system There are crossing places at all the intermediate stations, with the exception of Lochluichart, Glencarron platform, Attadale, Plockton, and Duirinish.



GOODS TRAIN NEAR ACHANALT.

Highland 4-4-0 locomotive No. 14, "Ben Dearg."

Kyle of Lochalsh is a business centre and a fishing and shipping port on the extreme west coast of Ross-shire. It possesses ample banking facilities, shops, churches, and hotels, including a small but extremely comfortable hotel owned and run by the L.M. & S.R. The hotel is only a few minutes' walk from the station, and is situated on the coast within a few feet of the high-water mark. It commands a magnificent view of the mountains of

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Skye. The village of Kyle, which was practically non-existent before the advent of the railway in 1897, is now an important interchange point for passenger and freight traffic for the Island of Skye and the numerous other Hebridean Islands. The mail steamers belonging to the well-known shipping firm of David MacBrayne Ltd., of Glasgow, ply regularly all the year round from Mallaig, on the West Highland section of the L. & N.E.R., to Portree and Broadford, on the Island of Skye, and also to Stornoway and Lochmaddy in the Outer Hebrides. All the boats make Kyle a port of call in both directions. During the summer months additional steamers are put into service and excursions are made to neighbouring lochs round the coast, including the wild and beautiful Loch Coruisk, of Bruce fame. It may be also mentioned that during the season excursions by water are made from Glasgow and the Clyde to Mallaig, Kyle, and the Hebridean Islands.

The railway station, freight warehouse, and the goods yard at Kyle of Lochalsh are situated partly on a rock cutting, and partly on a pier, constructed out from the rocky coast. The station consists of a double road platform, upon which are situated the offices of the L.M. & S.R., and also those of Messrs. David MacBrayne's local agent. There is also a good refreshment room on the station premises. Passengers for the boats proceed down a short slope at the western end of the platform on to the quay, and from there board the steamers. In order to cope with freight traffic and luggage, the railway company have equipped the quay with three hydraulic cranes and two steam cranes of 3 and 4 tons respectively. The station and quays are illuminated by lamps burning acetylene gas, which is generated in a special building on the company's premises.

A few remarks may now be made on the train service, and also the locomotives that are at present used on the Dingwall and Skye section. The regular passenger train service consists of three up and two down trains. The 7 a.m. and the 4.30 p.m. up from Kyle to Dingwall are mixed trains, while the 11 a.m. up from Kyle is the through train to Inverness. On the down there is the 10.20 a.m. mail from Inverness to Kyle and the 3.45 p.m. mixed train from Dingwall. There is only one regular freight train per day, and this is the 9.35 a.m. from Dingwall to Kyle. It will be seen that additional freight traffic can be conveyed over the Skye line in large quantities to all parts of Great Britain. Passenger trains call at all the intermediate stations between Dingwall and the Kyle of Lochalsh, with the exception of Glencarron platform, Attadale, and Duirinish, where the stops are conditional. The total journey from Inverness to Kyle occupies about 3¾ hours.

The locomotives utilised for working passenger and freight trains are usually of the small 4-4-0 mixed traffic type of the late Highland Railway, with outside cylinders. These engines were designed by Mr. David Jones, the first engine of the class coming out of Lochgorm Works, Inverness, in 1882. These locomotives were found to be the most suitable for negotiating the sharp curves on the Skye line, more especially between Stromeferry and the Kyle of Lochalsh. The small "B.2N," 4-4-0 class, with inside cylinders, built by Mr. Peter Drummond during the years 1898 to 1900, are also used when required.

However, the writer noticed recently that the 11.30 a.m. mail from Inverness to Kyle was worked regularly by a small "Ben," No. 16 "Ben Avon." This engine made the return journey as far as Dingwall on the 4.30 p.m. mixed train from Kyle.

Full details of both classes of locomotives were given in the September, 1921, number of the RAILWAY MAGAZINE by Mr. E. L. Ahrons, when dealing with the late Highland Railway in his article on "Train Working in the Latter Part of the Nineteenth Century."

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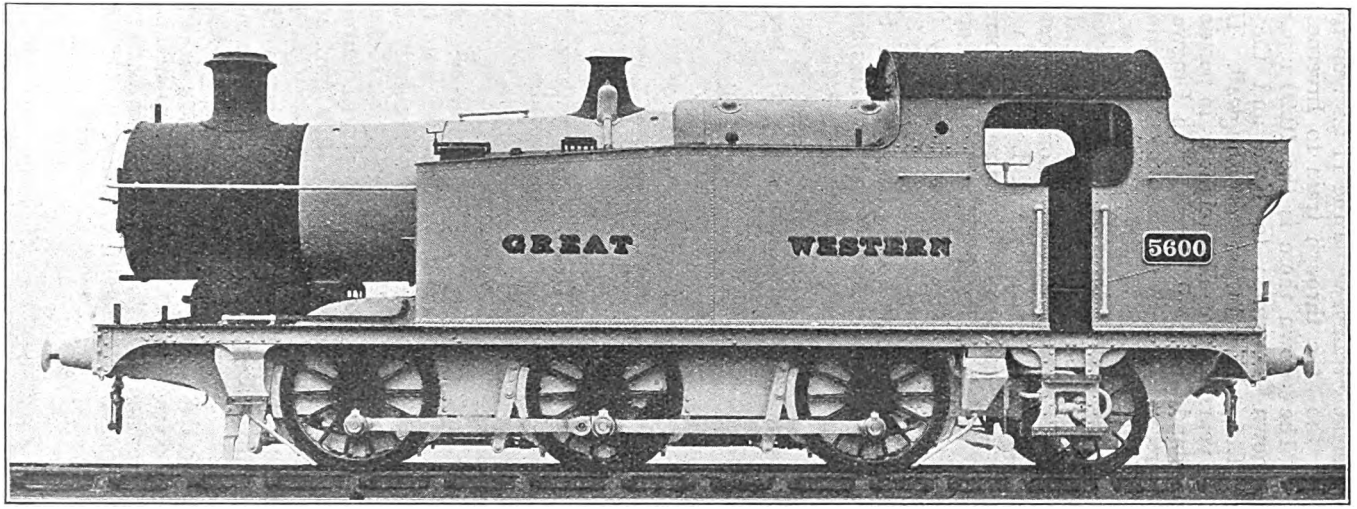
NEW 0-6-2 TANK ENGINES, GREAT WESTERN RAILWAY.



FIFTY of these locomotives are being put into service. They are the first of their type to be built at Swindon to the designs of Mr. C. B. Collett, Chief Mechanical Engineer, and are specially designed to deal with the heavy traffic of the South Wales coal fields over the long grades and sharp curves met with in that area, without exceeding the limit of weight imposed on many sections in this district.

The engines are fitted with 18-in. by 26-in. inside cylinders, having piston valves placed above them, which are supplied with steam from boilers carrying a pressure of 200 lb. per sq. in., fitted with superheaters.

The heating surfaces are as follows :—

Firebox	121·80 sq. ft.
Fire tubes	1,144·95 sq. ft.
Superheater tubes	82·20 sq. ft.
Total	1,348·95 sq. ft.
Grate area	20·35 sq. ft.

The coupled wheels are 4 ft. 7½ in. diameter, the trailing ends being carried on radial trucks.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

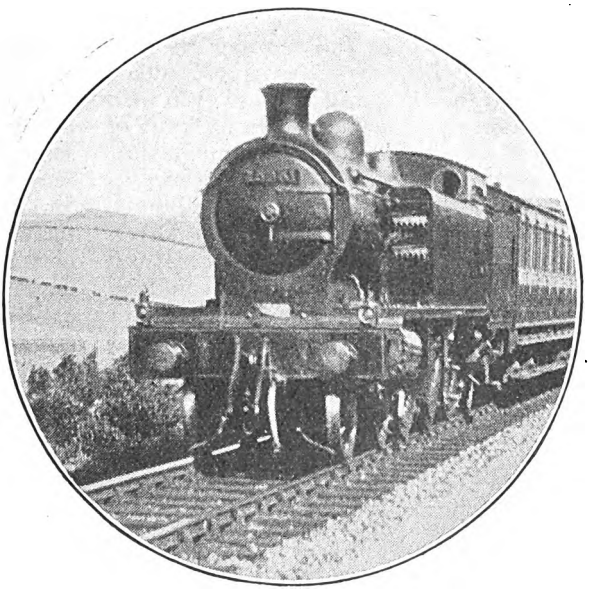

Photo.] [*C. J. L. Romanes.*

GLASGOW-WEMYSS BAY EXPRESS AT RAVENSCRAIG.

L.M.S.R. 4-6-2 Tank Engine No. 15351.

INTERCHANGE of locomotives between the different sections of our great railway groups continues to provide fascinating entertainment for those who make a study of locomotive performance. Last month the working of Great Central "Director" class 4–4–0 engines over the North British section of the L.N.E.R. came under review; next month I hope to have something to say as to the working of Great Northern "Pacifics" over various sections other than that for which they were first designed; and this month similarly exchanged locomotive working on the London Midland and Scottish Railway requires attention. Readers may remember that in the October issue I gave details of the times achieved on certain experimental trips over the Midland main line between Leeds and Carlisle. Loads far above the normal maximum allowance for Midland compounds were taken; trains of a tare weight of slightly over 350 tons were handled over Ais Gill Summit without assistance, by both the Midland compound 4–4–0 No. 1008 and also the London and North Western "Prince" 4-6-0 No. 388, and, generally speaking, within the limits of ordinary booked times.

These trials, which followed the decision to build twenty new compounds of the 1045–1064 series, doubtless influenced the construction of the further series from 1065 to 1084, the last of which, at the time of writing, has just left Derby shops. A number of these forty engines have been drafted over to the Western Division, where for some months past they have been working on the Birmingham and Manchester express services. The former, with loads such as prevail over their native system, have suited them quite well; but, from all accounts that have been current, the continued high speed required with heavy loads between Euston and Crewe has proved a different proposition altogether. Camden bank, again, has afforded a formidable starting obstacle. In this connection it should be remembered that, although the Midland compound starts from rest as a 2-cylinder simple, with (in the latest type) two 21¾-in. diameter cylinders, the steam is only admitted through the jockey-valve on the back of the regulator until the change-over to full compound working takes place. Thus, although these engines doubtless start better in such conditions then they would if started full compound, the steam is so severely throttled that much of the tractive value of two simple cylinders of such large diameter is lost.

The moral appears to be that, although

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for the working of the average Midland main line services over a sharply undulating line of the Midland type, and even with loads increased from the present limit of 240 and 260 tons on the present fastest timings to 300 tons (which increase, as recommended long ago in these columns, is, I believe, likely to come into force), the Midland compound is as capable and efficient a 4–4–0 locomotive as could be designed, the continuous output of power necessary to work 350 to 400-ton expresses at high speeds continuously over a fairly level road such as the North Western overtaxes its powers. Even the "George the Fifth" type 4–4–0 engines appear to do better than the compounds in the latter circumstances, and the "Prince of Wales" class 4–6–0's, despite their moderate dimensions, certainly do better. A heavier consumption of coal may be entailed in the latter cases, but, after all, it is the duty of time-keeping that first demands observance. When we come to the 4–6–0 "Claughtons" and the Horwich 4–cylinder 4–6–0 engines of the Hughes design, of course, we have considerably heavier and more powerful locomotives in every way. To expect a Midland compound to compete on level haulage terms with the last-mentioned types would be to expect a miracle.

In order to test further the maximum capabilities of the Midland compounds, some additional trials have been held recently over the Settle and Carlisle line, and in the course of travelling I have been fortunate enough to strike some of these personally. Other questions have, I believe, been wrapped up in these tests, such as the possibility of running through without change of engine from both Leeds and Crewe to Glasgow. Consequently the range of engines under test has been widened by the inclusion of Caledonian Pickersgill 4–4–0's, and—most interesting of all—by that of the "Claughton" class 4–6–0 No. 2221, *Sir Francis Dent.* I am rather at a loss to know why none of the superheated L. and Y. 4-cylinder 4–6–0 engines figured; there can be little doubt that these are the most powerful 4–6–0 locomotives in the possession of the L.M.S. group, and one can only suppose that some consideration of weight affected the decision. The latter are actually only about 4 tons heavier than the "Claughtons," but the shorter wheel-base in the Horwich case results in greater concentration of

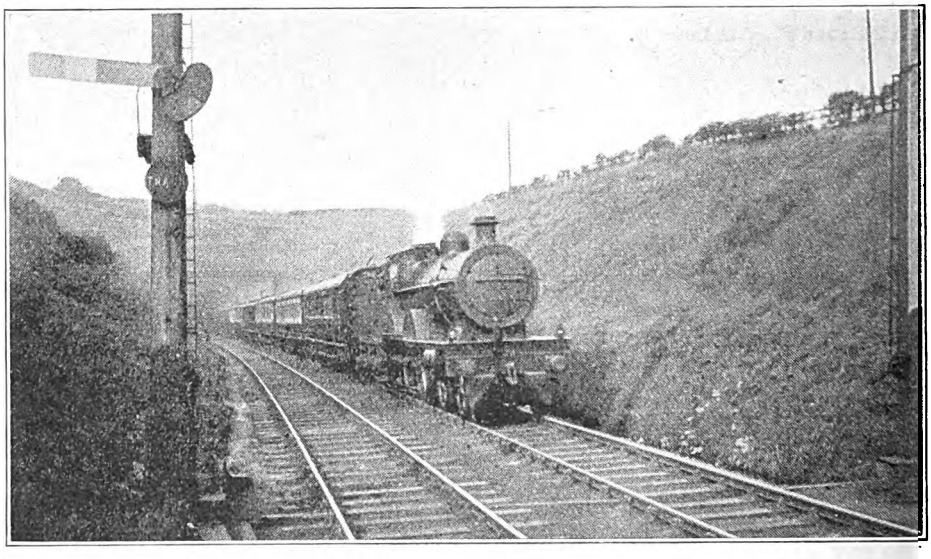

Photo.] [*Rev. J. S. Caddick-Adams.*

MANCHESTER-EUSTON EXPRESS EMERGING FROM HARECASTLE TUNNEL.

Midland compound 4-4-0 engine.

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weight. It would have been interesting too, to include an engine of the "George the Fifth" type; such exploits as that of *Wild Duck* with 410 tons between Euston and Crewe, or *Sunbeam*, in attaining 49 m.p.h. up Grayrigg bank with 265 tons from a dead start at Oxenholme, or *Penmaenmawr*, in taking a 54-axle, 390-ton train over Shap on the tightly-timed pre-war 6.24 p.m. ex-Preston, with no loss on the old 104-minute schedule to Carlisle and no help, are sufficient by way of demonstration of their ability. These runs were described in my articles of February, 1912, July, 1913, and January, 1915.

But to come back to the trials actually carried out. I had one run behind compound No. 1065, coming south on the 12.10 p.m. train, and we did splendidly, passing Skipton 2 min. early with a tare load of 305 tons, despite a special stop at Hellifield; after Skipton we suffered bad delays, but still arrived on time. But going north in the following week it was a different story altogether, as No. 1023, now superheated, with 345 tare tons, on a wet night, lost 14½ min. between Leeds and Carlisle, 3½ out to Hellifield and 11 beyond. Not so the "Claughton," however. A week later, on a much worse night, with rain and wind, No. 2221 lost 50 sec. to Hellifield, chiefly in virtue of exaggerated slacks at both Shipley and Skipton, but gained all but 2 min. from Hellifield to Carlisle, and would have gained 3 with a normal finish in from Scotby to the Citadel station; this again with 345 tare tons. Thus the "Claughton" showed an advantage of at least 17½ min. over the compound, in identical conditions. What the comparison was in the consumption of coal, however, I am unable to say. I was not able to accompany a Caledonian trip, but I gather that the Caledonian engines could barely manage the 300-ton trains, and were not therefore tried with anything heavier.

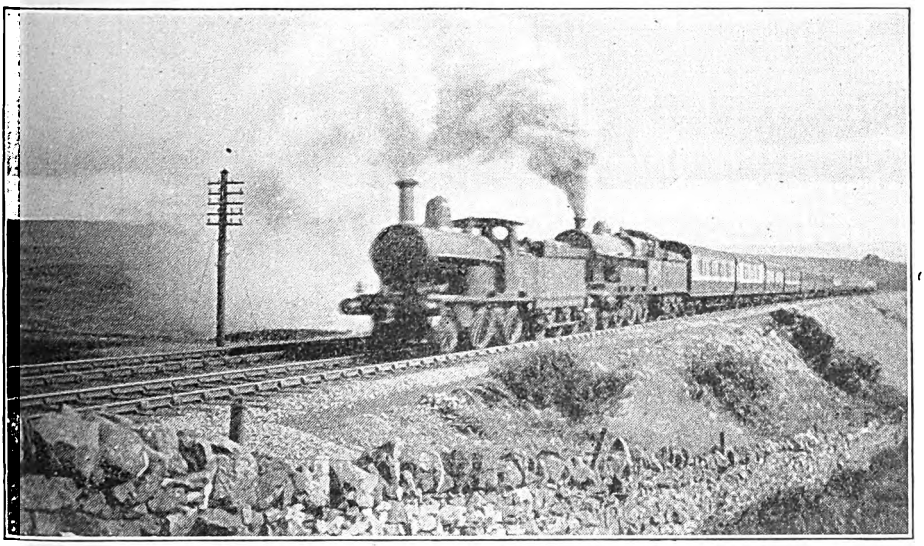

Photo.] ASCENDING SHAP. [*Rev. J. S. Caddick-Adams.*

Glasgow portion of 10 a.m. ex Euston. North Western 2-4-0 piloting 4-6-0 "Claughton."

I will now describe my three runs in detail. The times are set out in the accompanying table; the gradients I detailed fully in October last, and need not now recapitulate. No. 1023's train consisted of dynamometer car, a 12-wheeled "diner," 10 corridor "eights," and a six-wheeler; total, 53 axles, 345 tons empty and 360 tons full. It is hard to explain how the increase of merely 55 tons over the weight carried by No. 1008 in my tabulated run in October should have made so vast a difference in the running, but the difference certainly was extraordinary. From Settle Junction up to Blea Moor, in particular, No. 1008 with

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305 tons took 20 min. 44 sec., and No. 1023 took 31 min. 5 sec. Minimum speed in the former case was 33¼, and in the latter 15½ m.p.h. It is also somewhat surprising that No. 1023 continued to lose time after Ais Gill had been passed, the gain of a minute from Ais Gill to Appleby being more than offset by the loss of 1¼ min. from Appleby to Carlisle.

The performance of *Sir Francis Dem* was vastly superior in every respect—so far as concerns times and speeds, at any rate. If the running from Leeds to Skipton be compared with that given i the north-bound table in the October issue it will be seen that the "Claughton beat No. 998, with 50 tons less load, b 21 sec., and all but tied with No. 100

L.M.S. (MIDLAND DIVISION): LEEDS–CARLISLE.

Distance.	Engine No. / Load (axles) / (tons tare/full)	Schedule.	1023 (C 4-4-0) 53 345/360		2221 (W 4-6-0) 53 345/360		432 (R 4-4-0) 30 193/205	
			Times.	Speeds.	Times.	Speeds.	Times.	Speed
Miles.		min.	m. s.	m.p.h.	m. s.	m.p.h.	m. s.	m.p.h
0·0	Leeds	0	0 00	¶	0 00	¶	0 00	¶
0·8	Holbeck	—	2 40	—	2 25	—	2 15	—
3·1	Kirkstall	—	7 15	49	6 30	52	6 00	52½
7·5	Apperley Bridge	—	12 45	46	11 45	48½	11 20	—
10·9	Shipley (Bingley Jc.)†	15	17 45	26†	16 30	25†	15 35	40†
11·6	Saltaire	—	19 00	—	17 45	—	16 30	30*
13·8	Bingley	—	22 05	53	20 45	55	20 10	—
17·0	Keighley	22	25 55	51	24 30	54	24 25	—
21·9	Kildwick	—	31 05	61	29 20	66	29 40	—
23·2	Cononley	—	32 25	59	30 30	67	31 05	—
26·2	Skipton†	33	36 05	28†	33 50	30†	34 25	47†
		—	—	45½	—	48½	—	50
29·9	Gargrave	—	42 00	40	39 10	42½	39 15	42½
32·8	Bell Busk	—	46 10	43½	43 15	46	43 25	—
34·5	Summit	—	—	39½	—	40	—	37½
36·2	Hellifield	48	51 35	—	48 50	—	48 20	—
3·3	Settle Jc.	6	5 10	65	4 45	65	51 35	67
5·2	Settle	—	7 10	49	6 55	48	53 55	—
9·6	Helwith Bridge	—	15 20	26	13 55	32	—	31
		—	—	33	—	39½	—	40
11·3	Horton	—	18 45	24½	16 40	30½	64 35	—
		—	—	—	—	31½	—	—
16·0	Ribblehead	—	32 40	15½	25 35	30	73 10	32
17·3	Blea Moor Box	28	36 15	23§	28 10	32§	75 30	35½§
18·3	Summit	—	—	22	—	25	—	31½
22·2	Dent	—	44 40	—	35 55	—	82 20	—
25·4	Hawes Jc.	—	48 20	61	39 35	61	85 45	65
28·5	Ais Gill Box	41	51 45	50	42 55	51	88 55	—
35·3	Kirkby Stephen	—	58 15	71½	49 10	76½	95 05	75
43·6	Ormside	—	66 10	64½	56 30	71½	102 05	76½
46·0	Appleby	59	68 45	50	58 55	57½	104 20	61½
48·9	Long Marton	—	71 35	70½	61 35	74	107 00	74
57·0	Langwathby	—	79 15	—	68 15	80½	114 15	71½
61·4	Lazonby	—	83 25	—	71 40	62½‡	118 10	52‡
		—	—	—	—	74	—	66
66·9	Armathwaite	—	89 15	—	76 30	65	123 45	56½
74·1	Scotby	—	96 15	70½	82 45	77½	130 45	67
76·8	Carlisle	90	101 05	—	87 50	—	134 55	—

* Signal check (1 min. lost). † Service slack. ‡ At Summit 2 miles beyond Lazonb
§ Maximum at Ribblehead Viaduct. ¶ Maximum and minimum speeds, by chronograph, a *or near* stations shown. C = Midland 4-4-0 compound. R = Midland rebuilt and superheate 4-4-0, Class 2. W = North Western 4-cyl. 4-6-0 "Claughton" class.

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and the "Prince," carrying 55 and 60 tons less respectively, and that despite a more severe slack at Shipley than any of the others. Similarly, at Bell Busk, No. 2221, despite very much the hardest slack at Skipton Junction (commenced well before reaching the station), was only ½ min. behind No. 1008, and was ahead of the other two competitors. After Hellifield comparison is not so easy, in view of the introduction of the Hellifield stop in the winter schedule. From Settle station to Ribblehead the "Claughton" was a minute behind the "Prince" and No. 998, and a little over 2 min. behind No. 1008.

Then followed a distinctly thrilling speed exhibition, whereby I clocked my first "80" over this section since the war—and no niggardly maximum, either, but several miles of it past Little Salkeld—regaining 3 min. from Appleby to Carlisle, and virtually 4 min., if due allowance be made for the exceptional caution from Scotby. We averaged 68·7 m.p.h. over the 45·6 miles from Ais Gill to Scotby and 74·4 over the 12·5 from Long Marton to Lazonby. It will be noted that the sharp rise from the Eden bridge past Lazonby to the summit, two miles beyond, did not bring the speed below 62½ m.p.h.

The third run tabulated was a plucky

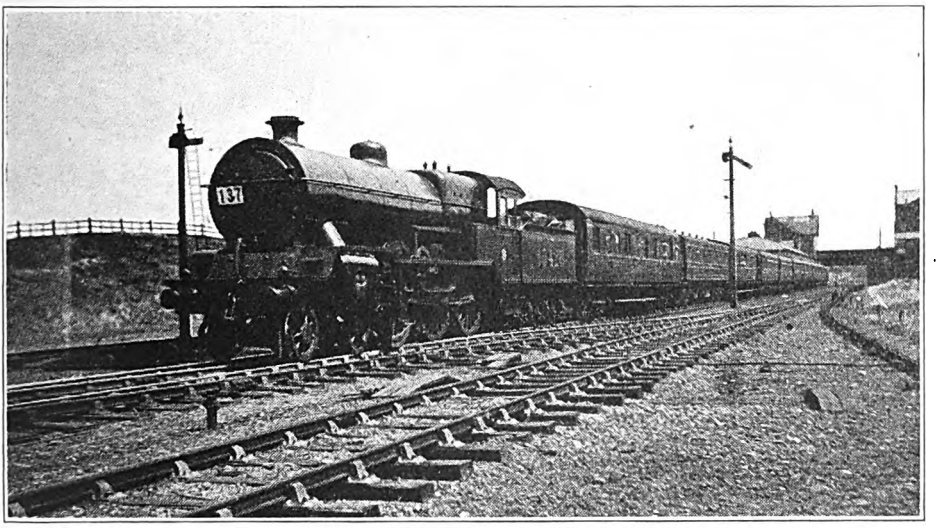

Photo.] **BOLTON-BLACKPOOL EXPRESS AT ANSDELL.** [*J. E. N. Ashworth.*

L.M.S. 4-6-0 locomotive No. 10426 (Hughes 4-cylinder type).

But the weather was terrible as we got on to the exposed lengths above Horton, and it was clear that the engine was beginning to run short of steam, the speed, which had been maintained nicely above the "30" level to this point, falling rather rapidly to 25 ere we entered Blea Moor Tunnel. This shortage of steam prevented any rapid recovery of speed beyond the tunnel, and so to the 1½ min. loss from Settle Junction to Blea Moor there was added 1¾ min. from Blea Moor to Ais Gill. But so brilliantly had we started from Hellifield that Blea Moor box was passed on time, and the arrears at Ais Gill were easily regained by Appleby.

little effort by one of the Class "2" rebuilt and superheated 4-4-0's in normal running, with the 11.45 a.m. from St. Pancras to Edinburgh, before that train lost its separate identity by incorporation into the midday Glasgow train. The Class "2" maximum load on this service is, I believe, 180 tare tons, so that we had 13 tons in excess. Despite a signal check between Saltaire and Bingley, No. 432 practically maintained time from Leeds to Settle Junction, although with the help of higher speeds over the Shipley and Skipton Junctions than normal; but 2 min. were dropped from Settle Junction up to Blea Moor, and we were 3 min. in arrears at

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Ais Gill. There was again some unusually fast downhill running; the lost time was practically recovered at Appleby (speed averaged 71 an hour from Kirkby Stephen to Ormside), but the work thence to Scotby fell considerably behind that of No. 2221 with a load 75 per cent. heavier. We just maintained our 135-min. schedule to Carlisle, however.

The exploits of No. 1065—the first of the "short chimney" compound series—on one of the up test trains, with the 300-ton load, or 305 tare tons, to be exact, may now be briefly described. Of the points shown in the October table, Crosby Garrett in 47 min. 55 sec., at 48½ m.p.h., and Kirkby Stephen in 52 min. 20 sec., at 37 an hour. The engine was not pressed on to Ais Gill, speed falling to 29 m.p.h. before Mallerstang and to 27½ before the summit, with an intermediate recovery to 39½ past Mallerstang box; so we took 58 min. 20 sec. to Mallerstang and 65 min. 5 sec. to Ais Gill—almost exactly 2 min. more than No. 1008, when the latter was similarly loaded in the October table.

There was nothing special to note about the subsequent figures; they were 68 min. 50 sec. to Hawes Junction, 77¼ min. to

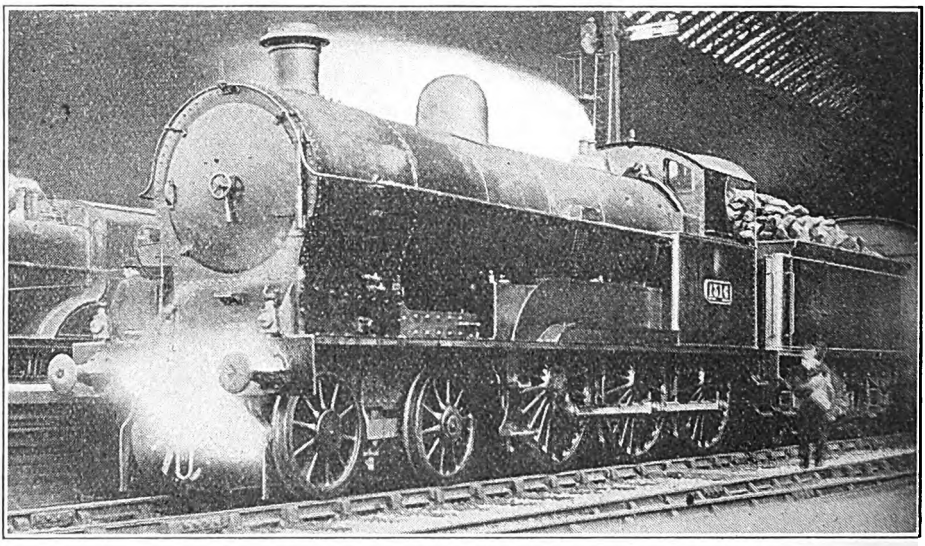

Photo.] [*L. A. Wroot.*

6.15 P.M. MIDLAND EXPRESS FROM ST. PANCRAS TO LEEDS AND BRADFORD.

L.N.W. "Prince of Wales" class 4-6-0 locomotive No. 1436.

Scotby was passed in 6½ min., at 31 m.p.h., Armathwaite in 17½ min., speed rising intermediately to 42 m.p.h., and then falling to 37, and Lazonby in 23 min. 20 sec. In crossing the Eden below Lazonby we touched 69 m.p.h., and thereafter passed Langwathby in 27½ min., at 59 m.p.h., Culgaith in 31 min. 10 sec., at 58½ m.p.h., Long Marton in 35 min. 55 sec., rising in speed from 55½ before New Biggin to 62½ after Long Marton, whence we fell to 51 m.p.h. before breasting Appleby in 39 min. 5 sec. Touching 67 an hour at Ormside, which we passed in 41½ min., we mounted the 1 in 100 at a minimum of 43 m.p.h., and were through Blea Moor, 89 min. 20 sec. to Settle Junction, and 5 sec. under 93 min. to a special stop at Hellifield, or 4 min. below the allowance to passing that point. Down from Blea Moor we touched maxima of 74 to 77½ m.p.h. on four occasions, with intermediate slacks to 65 or so. Despite 40 sec. standing at Hellifield, a similar amount standing at Shipley for adverse signals, a p.w.r. check through Skipton, and further signal checks at Keighley, Bingley, Saltaire and Armley, we maintained exact time into Leeds, gaining, in point of fact, 5 sec., but our net time was not more than 134 min. for the trip. This was, therefore, a very satisfactory

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run, but the increase of loads from the 300 to the 350 tare ton level appears somewhat to have overmastered compound ability as an all-weather figure.

The work of the L. & Y. 4-6-0 engines over the neighbouring Lancaster and Carlisle section of the Western Division affords comparisons of similar interest

L.M.S. (WESTERN DIVISION): CREWE-CARLISLE.

Distance.	Engine 4-6-0 No. ..	1671 L	103 C
	Load (axles) ..	46	50
	,, (tons tare) ..	324	351
	,, (tons full) ..	350	375
Miles.		m. s.	m. s.
0·0	Crewe	0 00	0 00
4·9	Minshull Vernon ..	8 50	8 30
8·8	Winsford Jc. ..	12 45	12 20
		sigs.	
16·2	Weaver Jc.	21 10	19 05
18·8	Preston Brook ..	23 35	21 30
24·1	Warrington	28 30	26 25
27·5	Winwick Jc. ..	31 55	29 45
29·9	Golborne Jc. ..	34 40	32 25
			sig.stop
35·8	Wigan	41 15	43 00
39·1	Standish	45 40	48 10
41·6	Coppull	49 00	51 45
45·5	Euxton Jc.	52 45	55 20
51·0	Preston	58 45	62 00
55·7	Barton	65 55	70 05
60·5	Garstang	70 45	74 50
67·6	Galgate	78 05	81 55
72·0	Lancaster	82 30	87 40
78·2	Carnforth	88 30	8 40
82·7	Burton	93 35	13 40
85·5	Milnthorpe	96 30	16 35
91·1	Oxenholme	103 50	24 20
98·1	Grayrigg	116 20	38 15
104·1	Tebay	123 05	45 40
			stop ¶
109·7	Shap Summit ..	133 45	57 40
111·7	Shap	136 35	60 05
119·0	Clifton	143 10	66 20
123 2	Penrith	146 55	70 05
128·0	Plumpton	151 30	74 30
136·2	Wreay	158 20	81 00
		sigs.	sigs.
141·0	Carlisle	163 40	87 10
141·0	Net times (min.) ..	161¾	82¾+86

¶ For bank engine to Shap Summit.
L = L. & Y. 4-cyl. type.
C = 4-cyl. "Claughton" type.

with the performance of the standard North Western types. In the second table will be found details of two runs from Crewe to Carlisle—one with L. & Y. four-cylinder 4-6-0 No. 1671, taking 350 tons on the non-stop 1.7 p.m. express, and the other with "Claughton" No. 103, carrying 375 tons on the 4.44 p.m. train. The latter—the 1.30 p.m. out of Euston—used, before the war, to take 169 min. from Crewe to Carlisle, with 6 min. standing at Preston, and now is allowed 176 min. with 4 min. standing at Lancaster; making due allowance for the high speed of non-stopping trains through Lancaster, the booking is now at least 6 or 7 min. easier than in pre-war days. The 1.7 p.m. non-stop schedule of 163 min. is, however, only 4 min. over the pre-war figure, and, load for load, No. 1671 had materially the harder task of the two. But the latter engine kept time, despite adverse signals at Winsford, whereas the former, suffering a dead signal stand of 15 sec. outside Wigan, and about a minute's loss by signals outside Carlisle, lost 2¼ min. So the L. & Y. engine had distinctly the better of it.

No. 1671 did nothing of particular note in the early stages; after the Winsford check we touched 70½ m.p.h. at Preston Brook, mounted Boar's Head bank at a minimum of 40, and touched 70½ again before slacking to 60 over Euxton Junction. Speed ranged round about the mile-a-minute rate from Brock onwards to Lancaster, and was not allowed to exceed 64½ through the county town, nor past Hest Bank. From 62½ an hour at Carnforth we fell to 48½ up the 1 in 131 to Burton; touching 60 again at Milnthorpe, we were down to 46½ at Hincaster Junction, 38 at Oxenholme, 32½ on Grayrigg bank, rising to 35 at the beginning of the 1 in 106 and falling again to 31 at Grayrigg summit. At Dillicar troughs we were doing 64 an hour, and then, after falling to 23 an hour on the final 4 miles at 1 in 75, we recovered to 24 at the summit, the time of 10 min. 40 sec. from Tebay to Summit with this load being very fair. A rapid descent was made to Carlisle; I recorded maxima of 70½, 71½, 74 and 75 m.p.h. (at Clifton Junction), with intermediate slowings, before the usual severe slack over Eamont Bridge and through Penrith; and then we reached 70½ an hour at Plumpton, 74 at Calthwaite, and 80½ at Southwaite, showing that these engines have no objection to high speed. But we slacked through Wreay and, after a momentary maximum of 77½ below, finished cautiously into Carlisle.

The "Claughton" started well, gain-

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ing 2¼ min. to Winwick Junction, and then, although the Wigan signal stop involved us in a loss of 5½ min. from Winwick to Standish, we were ¼ min. early at Lancaster, chiefly in virtue of really good running along the level from Barton onwards. But after passing Carnforth at 64½ m.p.h., Burton summit at 47½, Milnthorpe at 58½, and Hincaster Junction at 44½, we did not do brilliantly up Grayrigg bank, speed dropping to 34 an hour at Oxenholme, 30—recovering to 32½—before the 1 in 106 was entered upon, and 29 at Grayrigg. The next thing—not altogether to my surprise after this exhibition—was a stop at Tebay for banking assistance to Summit; after a halt of 65 sec., we attained 35 m.p.h. at Scout Green, and continued at that speed to the top. Then the driver did what he could to reduce the arrears of time, as we had lost 6¼ min. on schedule from Oxenholme to Summit, and passed the latter point 4¾ min. late. Speed ranged chiefly from 74 to 77½ m.p.h. down to Eamont Bridge; then, after the Penrith slack, we ran continuously at 72½ to 80½ m.p.h. from Plumpton practically to the point of slowing down for Carlisle; the maximum figure quoted was reached both near Southwaite and again below Wreay. With a clear road into Carlisle, we should have picked up from 3½ to 4 min., and should have been almost on time on arrival. Both these descents from Shap were a refreshing relief from the tedium of previous runs, and the travelling in the train, I need hardly add, was perfectly smooth and comfortable throughout.

In conclusion, I will come southwards to the L.M.S. London and Birmingham services, both to show what the "George the Fifth" class engines are doing on the 2-hour trains with loads considerably heavier than those with which I dealt in earlier issues of this year, and also to give a further example of Midland compound working on the same service. All the journeys are on the two hardest turns of the day—the 9.10 a.m. down and the 4.50 p.m. up—with their 109-minute runs over the 107·5 miles between Willesden and Birmingham. In one instance, on the down journey, it will be seen that the 4-4-0 engine was required to tackle a 42-axle train of 320 tons all found—on a Monday morning, I need hardly add. I am not aware as to whether a Midland compound is ever drafted to the down train; but such working is, of course,

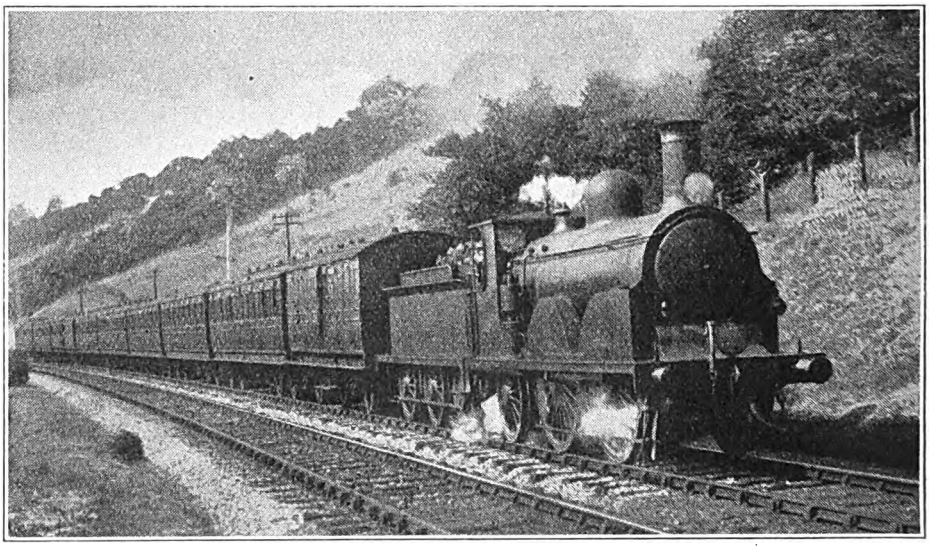

Photo.] [*C. Laundy.*

DOWN SOUTHERN RAILWAY TRAIN ON OXTED LINE (L.B.S.C. SECTION).

Drawn by Stroudley 0-4-2 engine No. 200 (with original chimney and fittings).

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frequent on the up journey, whereon there generally returns the Camden engine which has gone down on the 11.30 a.m. from Euston to Wolverhampton.

The run of *Henry Maudslay*, in the first column, is included in view of its remarkable start, although the load on this occasion was comparatively light. I was first electrified by a speed of 56½ m.p.h. at Queen's Park, whereby we stopped at Willesden in 8 min. 50 sec., and were away again in 9 min. 50 sec. from Euston. Never previously have I recorded a fresh start from Willesden in less than 10 min. out of the terminus. Then, after restarting, we accelerated to 54 an hour at Wembley, and 60 at Harrow (up 1 in 330), after which the engine was apparently notched up, as we fell to 57 at Hatch End. But at Watford we were up to 70½ m.p.h., and although speed dropped rather rapidly in the tunnel, we main-

L.M.S. (WESTERN DIVISION): WILLESDEN–BIRMINGHAM.

Distance.	Run No.	Schedule.	1.	2.	3.	4.	Distance.	Schedule.	5.
	Engine, 4-4-0 No.		2168 G	374 P	238 G	282 P			1053 M
	,, Name		*Henry Maudslay*	*Empress*	*F. W. Webb*	*Alaric*			—
	Load (axles)		30	34	38	42			34
	,, (tons tare)		214	250	270	295			239
	,, (tons full)		225	270	290	320			255
Miles.		min.	m. s.	m. s.	m. s.	m. s.	miles.	min.	m. s.
0·0	Willesden	0	0 00	0 00	0 00	0 00	107·5	109	107 55
									sigs.
2·7	Wembley	—	4 15	4 50	5 15	5 00	104·8	—	104 05
6·0	Harrow	—	7 40	8 30	9 25	8 40	101·5	—	101·15
7·9	Hatch End	—	9 40	10 30	11 40	10 45	99·6	—	99·35
10·6	Bushey	—	12 15	13 10	14 35	13 30	96·9	—	96·55
12·1	Watford	14	13 35	14 35	16 10	14 50	95·4	97	95 35
15·6	King's Langley	—	16 50	18 00	19 45	18 10	91·9	—	92·25
19·1	Boxmoor	—	20 15	21 40	23 20	21 45	88·4	—	89 25
22·6	Berkhamsted	—	23 45	25 25	26 50	25 15	84·9	—	86 25
26·3	Tring	29	27 45	29 25	30 35	29 10	81·2	83	82 45
30·7	Cheddington	—	32 10	33 30	34 25	32 55	76·8	—	78 15
34·8	Leighton	—	35 50	36 50	37 30	36 15	72 7	—	74 20
41·3	Bletchley	43	42 00	42 15	42 35	41 50	66·2	67	68 15
47·0	Wolverton	—	47 35	47 15	47 05	46 50	60·5	—	62 50
49·4	Castlethorpe	—	49 50	49 20	49 00	49 00	58·1	—	60 45
54·5	Roade	55	55 25	54 35	53 50	54 25	53·0	54	56 00
57·4	Blisworth	58	58 25	57 30	56 20	57 25	50·1	51	53 00
				p.w.r.					
64·3	Weedon	—	64 50	66 20	62 05	63 35	43·2	—	46 15
69·9	Welton	—	70 00	73 15	67 05	68 40	37·6	—	40 45
					sigs.	sigs.			
77·2	Rugby	77	78 00	80 45	75 00	82 30	30·3	31	31 20
77·8	Rugby, No. 7 Box	—	78 55	81 45	75 45	83 30	29·7	—	30 30
					sig. stop				
83·7	Brandon	—	84 35	87 25	87 45	90 10	23·8	—	24 55
				p.w.r.					
88·6	Coventry	88	89 05	93 55	92 10	94 40	18·9	19	20 35
92·1	Tile Hill	—	92 45	98 35	95 35	98 20	15·4	—	16 45
94·1	Berkswell	—	94 55	100 45	97 35	100 30	13·4	—	14 55
97·4	Hampton	—	98 10	103 45	100 30	103 35	10·1	—	11 45
101·0	Marston Green	—	101 40	106 55	103 25	106 45	6·5	—	8·35
103·7	Stechford	—	104 25	109 30	105 45	109 15	3·8	—	6·05
105·6	Adderley Park	—	106 15	111 25	107 35	111 05	1·9	—	3·50
107·5	Birmingham	109	109 15	114 25	110 25	113 50	0·0	0	0 00
107·5	Net times (min.)	109	109¼	107	102	107	107·5	109	107

G = "George the Fifth" class. P = Superheated "Precursor" class. M = Midland compound.

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tained 61½ an hour as far as Boxmoor, after which we fell to 56½ at Berkhamsted and 54 at Tring. To get over Tring summit in 37 min. 35 sec. from the Euston start, inclusive of a 60-second stop at Willesden, was really rather an extraordinary feat. After that there was nothing further of material interest, as we were so well in front of time, and, for a wonder, experienced no checks; our overall time from Euston to Birmingham was 119 min. 5 sec., and the actual running time a minute less.

There was nothing of special interest about the performance of *Empress*, in column 2; minima out to Tring were 57½ m.p.h. at Hatch End and 55½ from Berkhamsted to the summit, with a maximum of 66 at Watford; subsequent speeds were 74 an hour at Cheddington, 72½ at Leighton, 70½ at Bletchley, and 74 again at Wolverton. At Castlethorpe we had just bettered "even time"; at Roade the minimum rate was 54 m.p.h.; but some of the best work of the journey, yielding a top speed of 71½ m.p.h. beyond Blisworth, was cut short by a very bad p.w.r. check near Weedon, to 20 m.p.h. After a second check of the same kind, between Brandon and Coventry, the driver appeared to lose heart, and there was little to note about the rest of the run. Overall time from Euston to Birmingham was 125 min. 20 sec., Willesden being cleared in this case in 10 min. 55 sec.

We now come to the brilliant effort of *F. W. Webb*, in column 3. The engine was not exerted to any extent from the Willesden start, as by Harrow we had only risen to 49½ and by Hatch End to 53 m.p.h., while the maximum at Watford was not more than 62 an hour. But to such effect did the driver then open out, that we never fell below the mile-a-minute rate up to Tring—and this, be it remembered, with 290 tons up a continuous 1 in 330, commenced at a lower rate than usual. Going down the north side we reached 77½ m.p.h. at Cheddington, and just touched the "eighty" line between there and Leighton, while a rate barely varying from 77½ m.p.h. was maintained from Bletchley through to Castlethorpe. Roade summit was "rushed" at a minimum of 64½ m.p.h., and after we had reached 72½ m.p.h. on the but little easier than level length from there to Weedon, we "rushed" Kilsby summit also at a minimum of 64½ m.p.h. From Watford to Welton, therefore, we had covered 57·8 miles in 50 min. 55 sec., at an average of 68·1 m.p.h., without speed falling once

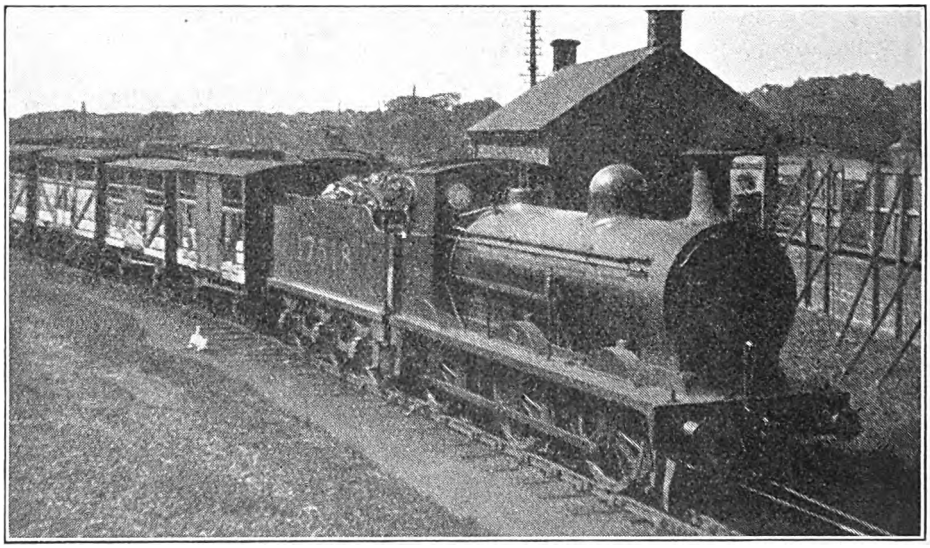

Photo.] [*J. J. Cunningham.*

L.M.S. (G. & S.W. SECTION) 0-6-0 LOCOMOTIVE No. 17518 SHUNTING AT ANNAN.

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below 60 m.p.h.; over the 23·1 miles from Tring to Castlethorpe we averaged 75·3 m.p.h.

In consideration of the fact that *F. W. Webb* had a train of 290 tons against the 190 of *Titan* in the startling run I recorded in the April issue of last year, the 75·3 m.p.h. average just referred to was a considerably finer achievement than the 77·7 m.p.h. in *Titan's* case. Then followed two cruel checks; a p.w.r. caution at Hillmorton, and a dead stand at the 84th mile-post for 3 min. 15 sec. (we had completed the 78·6 miles from Willesden to this point in 77 min. 5 sec., or 76 min. net, start-to-stop), enough to discourage any crew. I only wish I had had time to ascertain the name of our driver, however, as his concluding spurt, whereby we ran the 18·9 miles from the signal stop into New Street in 20 min. 5 sec., start-to-stop, was the pluckiest part of the whole journey. We were doing 68 an hour at Brandon, went up to Beechwood Tunnel at a minimum of 60, touched 75 at Hampton and again beyond Marston Green, and were still maintaining 68 at Stechford, with the result that we rolled into New Street less than a minute behind time! We had cleared Willesden in 10 min. 25 sec. from the start, and our net time from Willesden to Birmingham could not have exceeded 102 min.

The performance of *Alaric*, with as much as 320 tons, was also magnificent. By the combination of an excellent start with fast downhill running from Tring, the most heavily loaded engine was actually ahead of all competitors from Bletchley to Wolverton! We were doing 55½ m.p.h. at Harrow, 57½ at Hatch End, 69 at Watford, round about 58 from Boxmoor to Tring, 79 at Cheddington, 71½ at Leighton, 70½ at Bletchley, 53½ at Roade, 67 at Welton, and 61½ sustained (a remarkable figure this) past Welton. But then followed a very bad series of signal checks, costing us fully 6¾ min. Excellent running was made beyond Rugby, with speeds of 67 an hour at Brandon, 55½ at Beechwood Tunnel, 71½ at Marston Green, and 65 still sustained at Adderley Park, but these were not sufficient, of course, to recover all our delay, and we arrived 4½ min. late. But a net time under "even" from Willesden to Birmingham, with 320 tons, was a fine achievement for a 4-4-0 engine. I very much doubt, indeed, whether a Midland compound would have paralleled the times of either of the two runs last described, hauling similar loads.

And now for the Midland compound run on the 4.50 p.m. up. It had certain rather curious features. We were doing 48½ m.p.h. at Adderley Park, 57½ at Stechford, 66 at Marston Green, 68 at Hampton, and 61½ at Beechwood Tunnel, but were eased to 57 through Coventry (this seems now quite a common practice); a maximum of 68 at Brandon preceded a slack to 44 an hour through Rugby. Then we accelerated to 52 m.p.h. up to Kilsby Tunnel, but by premature notching up fell to 47½ at the south end, whence we ran rather feebly down to Weedon with no higher rate than 66 m.p.h. At Roade the minimum rate was 57½ m.p.h. and at Castlethorpe the maximum was 71½; from Wolverton onwards we woke up thoroughly, and the time of 22 min. for the 23·1 miles from Castlethorpe to Tring, almost all adverse, with speeds of 66 an hour at Bletchley, 64½ at Leighton, 60 at Cheddington and 57 at Tring, was the best part of the journey. After that we went moderately down to Willesden, touching 66 m.p.h. at Berkhamsted, 70½ at Boxmoor, and 72½ at King's Langley, easing to 65 at Watford and falling to 60 at Carpender's Park, after which our final maximum was 71½ m.p.h. at Wembley. Quite a good, though not an exceptional, run; in this connection it should be remembered that the up Birmingham journey on the North Western is distinctly easier than the down. After standing 85 sec. at Willesden, we reached Euston in 118 min. 55 sec. from Birmingham.

Several correspondents have written to express their mystification at my references in last December's article as to possible rivals of the Great Western "Castles." I should hardly have thought that the discovery of the other type to which I referred would occasion any very serious cogitations. The immediate proximity of the two at the Wembley Exhibition, where their relative tractive powers were advertised on most unblushingly competitive lines, should afford the necessary clue. But as to where, when and how the actual competitive test may take place, I am unable to speak further at present.

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1825-1925.

II.—BUILDING UP THE BRITISH RAILWAY SYSTEM.

By G. A. SEKON.

(*Continued from page* 53, *January Number.*)

[N.B.—In cases where the distances given in this article do not agree with present mileage, "cut-offs" or other more direct lines have subsequently been opened.]

BY the Grand Junction Railway, railway communication was continued northward from Birmingham to Liverpool and Manchester *via* Crewe and Warrington. Although not sanctioned by Parliament until 1833, the proposal had been made as early as 1824 for a railway between Birmingham and Birkenhead. It was, however, rejected that year at Westminster, as were also similar Bills in 1826 and 1830. In 1833 the scheme was altered north of Crewe to a railway to Warrington, whence there was already a line to the Liverpool and Manchester Railway at Newton. The Act for the Grand Junction Railway was obtained on May 6, 1833, the day on which the London and Birmingham Railway was sanctioned. This date is a notable one in railway history, as on it were authorised railways that connect London with the chief provincial centres: Birmingham, Liverpool and Manchester.

Stephenson and Locke were the engineers. Dividends of 14 per cent. per annum were expected! No clergyman was to be a director!

The Northwich Viaduct, 60 ft. high, of 20 arches of 60-ft. span, was the only big engineering work on the line, but heavier gradients than on the London and Birmingham and Liverpool and Manchester Railway were employed—the Madeley Bank is 6 miles long and as steep as 1 in 180 for a portion. With the exception of the Birmingham terminus and the Lawley Street approach viaduct, the whole line (78 miles) was opened to a temporary station at Birmingham on July 4, 1837. Four and a-half hours were occupied on the journey between Birmingham and Liverpool or Manchester by the express trains. By arrangement with the Liverpool and Manchester Railway, the trains of the Grand Junction Railway worked over the former line between Newton and Liverpool and Manchester—an early example of running powers. The rails on this railway weighed 85 lb. per yard, they were doubled headed, but the practice of turning them did not prove satisfactory. The rolling-stock was a great advance on that of other railways. The practice of naming all first-class coaches was adopted by the Grand Junction Railway as on other railways of the period.

The London and Southampton Railway was the outcome of a proposal launched in 1831, revived in 1832, and sanctioned in 1834, to construct a railway 76¾ miles long by means of £1,330,000 capital and loans; the line, however, cost £2,188,000. Giles was the engineer, construction was let to small contractors, who made little progress with the work, yet the capital was almost exhausted by the end of 1836. Locke was then appointed engineer. Power to raise more money was obtained, and on May 12, 1838, the first train was run from the out-of-the-way London terminus in Nine Elms Lane, Battersea (now the London and South Western Railway Section goods station), to Woking. A town grew up at the place now designated Surbiton, then named Kingston-upon-Railway to distinguish it from the adjacent Kingston-upon-Thames and the far-off Kingston-upon-Hull. The line was completed in 1840; through trains commenced to run between Nine Elms and Southampton on May 11. There are no notable engineering works on the line, the Steventon bank, 60 ft. high, being the principal. The termini are on the same level, the summit is at Lichfield, 392 feet above datum, but the rise from Nine Elms is spread over nearly 54 miles, whilst the fall to Southampton is made in 23 miles. The title London and South Western Railway was assumed in 1839.

The London and Croydon Railway, sanctioned in 1835, and opened in June,

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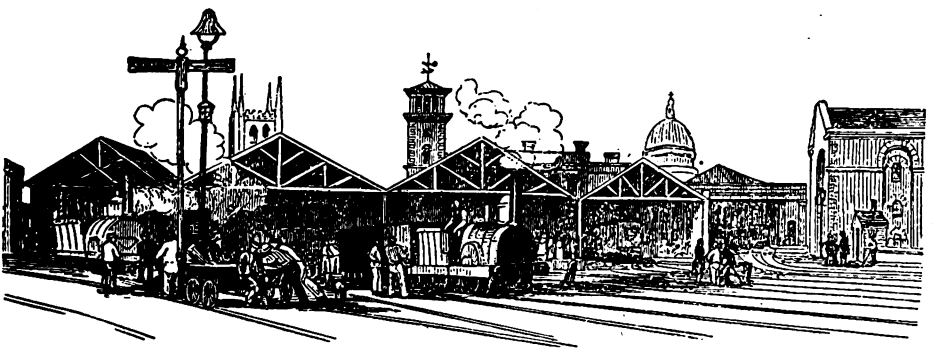
1839, was the first railway connecting the capital with the outer suburbs, and the early residential development of the southern suburbs as compared with the slower filling-up of the northern districts, can be attributed to the construction of this railway, the trains of which passed over the Greenwich line between Corbetts Lane and London Bridge, a distance of 1¾ miles. The acquisition of the Croydon canal assisted the quick construction of the railway, as no course had to be surveyed or land purchased, but the steep rise of 1 in 100 from New Cross to Forest Hill has proved a drag upon the working. The canal made this ascent by means of 28 locks. The Croydon Railway, which was originally laid with longitudinal sleepers and wide flange rails, made an experiment with atmospheric traction, which can be considered as satisfactory, but the acquisition of the railway by the London, Brighton and South Coast Railway in 1846 stopped the contemplated extension to Epsom, as well as causing the abandonment of the atmospheric system on this railway.

The Great Western Railway, which after various unsuccessful applications to Parliament was incorporated on August 31, 1835 (5 & 6 Wm. IV., cap. 107), introduced much discord in the dovecotes of railway engineers. The line was laid by Brunel on principles and with features widely divergent from the then existing canons of railway engineering, but the adoption of a gauge of 7 ft. instead of the usual 4 ft. 8½ in. was the great bone of contention. The dispute soon became a subject of general importance, and in a degree broad gauge and narrow gauge divided the country into parties almost as clearly as did Whig and Tory. The controversy, although practically settled by the Gauge Act of 1846, lingered on until the Great Western Railway finally abolished the broad gauge in May, 1892. There were many good points about the broad gauge, and it is at least conceivable that, had other conditions existed, the broad gauge might have been with us now. Apart from the 7-ft. gauge, the general levelness of the railway to Bristol —the difference in level being chiefly concentrated at one point, the famous Box tunnel—and the generous limits of some early locomotives gave prominence to the Great Western Railway, which it has since retained. The line from a temporary station at Paddington to Taplow was opened June 1, 1838, and throughout to Bristol on June 30, 1841, a distance of 117½ miles. Estimated to cost 3⅓ millions of pounds, an additional £1,666,666 was required to complete the Great Western Railway to Bristol.



LONDON BRIDGE STATION IN 1845.

(*From an Old Print.*)

The first use of the electric telegraph was made on the Great Western Railway, the patentees, Cook and Wheatstone, having arranged for the apparatus to be installed. Between Paddington and West Drayton it was in operation early in 1839.

The Bristol and Exeter Railway, 72 miles in length, a broad gauge western continuation of the Great Western Rail-

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Great Western Railway.

LONDON TO MAIDENHEAD.

a d 1839.

On and after the 1st of May, the SOUTHALL STATION will be opened
For Passengers and Parcels.

An **Extra Train to Slough** will leave Paddington on **Sunday Mornings**, at **half-past 9 o'clock**, calling at Ealing Hanwell, Southall and West Drayton.

Horses and Carriages, being at the Paddington or Maidenhead Station ten minutes before the departure of a Train will be conveyed upon the Railway.

Charge for 1 wheel Carriage, 12s. *Two wheel ditto*, 8s. *For 1 Horse*, 10s. *Pair of Horses*, 16s.

Post Horses are kept in readiness both at Paddington and Maidenhead, and upon sufficient notice being given at Paddington, or at the Bull and Mouth Office St Martin's-le Grand, would be sent to bring Carriages from any part of London to the station, at a moderate charge

TRAINS.

From Paddington		To Maidenhead.	From Maidenhead		To Paddington.
8 o'clock morn.	calling at	Southall and Slough	6 o'clock morning,	calling at	Slough
9	do.	Slough		and on Wednesday Morning at	Southall;
10	do.	West Drayton and Slough	8	do.	Slough and West Drayton
12	do.	West Drayton and Slough	9	do.	Slough and West Drayton
2 o'clock afternoon		West Drayton and Slough	10	do	Slough and Southall
4	do.	Slough	12	do.	Slough and West Drayton
5	do.	Hanwell and Slough	2 o'clock afternoon		Slough and Southall
6 o'clock evening		Ealing, West Drayton and Slough	4	do	Slough
7	do	Southall and Slough	5	do.	Slough and Hanwell
8	do.	Slough	6 o'clock evening		Slough and West Drayton
			7	do.	Slough and Ealing

The six o'clock up Train will call at Southall on Wednesday mornings, for the convenience of persons attending the market on that day.

SHORT TRAINS

From Paddington		To West Drayton.	From West Drayton		To Paddington.
½ past 9 o'Clock Morning,	calling at	Ealing, Hanwell, AND Southall,	½ before 9 o'Clock Morning,	calling at	Southall, Hanwell, AND Ealing.
½ past 1 do Afternoon,			½ before 11 do.		
½ past 4 do. do			½ before 3 Afternoon		
½ past 8 do. Evening			½ before 7 o'Clock Evening		

☞ *There are no second class close carriages in the short Trains*

Passengers and Parcels for Slough and Maidenhead will be conveyed from all the stations by means of the short Trains, waiting to be taken on by the succeeding long Train, as above; and in like manner they will be conveyed from Maidenhead and Slough, to every station on the Line.

On SUNDAYS.

From Paddington		To Maidenhead.	From Maidenhead		To Paddington.
8 o'clock Morn	calling at	Ealing and Slough	6 o'clock morn	calling at	Slough
½ past 8 do	do	West Drayton and Slough	8 do	do.	Slough Southall and Ealing
9 do	do	Southall and Slough	9 do	do.	Slough West Drayton and Hanwell
5 afternoon	do	Hanwell West Drayton and Slough	5 afternoon	do.	Slough and Hanwell
6 evening	do	Ealing West Drayton and Slough	6 evening	do.	Slough and West Drayton
7 do	do	Southall and Slough	7 do.	do	Slough and Ealing

SHORT TRAINS.

PADDINGTON TO SLOUGH.

Half-past Nine o'Clock Morning, . . . calling at Ealing, Hanwell, Southall, and Drayton.

To West Drayton.			From West Drayton.		
½ past 9 o'Clock Morning,	calling at	*Ealing, Hanwell, & Southall and proceeding to Slough*	½ before 8 o'Clock Morning,	calling at	*Southall, Hanwell & Ealing.*
½ past 8 do. Evening,		*Ealing, Hanwell & Southall*	½ before 7 do Evening,		

FARES.

Paddington.	1st. Class Coach	Second Class. Close.	Second Class. Open.	Maidenhead.	1st. Class Coach.	Second Class Close	Second Class Open.
To *Ealing*	1 6	1 0	0 9	To *Slough*	2 0	1 6	1 0
Hanwell ..	2 0	1 6	1 0	*West Drayton*	3 0	2 6	2 0
Southall ...	2 6	1 9	1 3	*Southall*	4 0	3 0	2 6
West Drayton	3 6	2 0	1 6	*Hanwell*	4 6	3 6	3 0
Slough	4 6	3 0	2 6	*Ealing* .. .	5 0	4 0	3 6
Maidenhead.	5 6	4 0	3 6	*Paddington*.	5 6	4 0	3 6

The same Fares will be charged from Slough to West Drayton as from Maidenhead to Slough.

OMNIBUSES and Coaches start from Princes Street, Bank, one hour before the departure of each Train, calling at the Angel Inn, Islington; Bull Inn, Holborn; Moore's Green Man and Still, Oxford Street; Golden Cross, Charing Cross; Chapliu's Universal Office, Regent Circus; and Gloucester Warehouse, Oxford Street, to the Paddington station.—**Fare 6d.** without Luggage.

FAC-SIMILE OF AN EARLY GREAT WESTERN RAILWAY TIME-TABLE.

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way, was authorised in 1836 and opened in sections. It was completed May 1, 1844. Brunel kept in view the value of a level railway when laying out the Bristol and Exeter, and concentrated the chief gradients at Whiteball; the rise from the Taunton side is 4 miles at 1 in 127, and the fall towards Exeter 5 miles at 1 in 227. For some years the Great Western Railway leased the Bristol and Exeter Railway, but from May, 1849, until it was amalgamated with the Great Western Railway, the Bristol and Exeter Railway provided its own locomotives and other rolling-stock and worked its own railway.

Although somewhat out of chronological sequence mention may here be made of the South Devon Railway, a continuation from Exeter westward for 52½ miles to Plymouth of the broad gauge system. The Act is dated July 4, 1844; the capital asked for was only a million pounds, the Great Western, Bristol and Exeter, and Bristol and Gloucester Railways between them subscribing £400,000. Brunel had by this time adopted the atmospheric system, and it was proposed to work the South Devon Railway on this principle; indeed, the line from Exeter to Teignmouth and afterwards on to Newton Abbot was so worked for nearly a year from September, 1847. The bold scheme was adopted of constructing the railway along a terrace between the cliffs and the sea from Dawlish to Teignmouth, and along the estuary of the Teign between Teignmouth and Newton Abbot, thus obtaining a level line for 20 miles. Until the authorisation of this line, railways, either by statute or to save the purchase of expensive property, had shunned passing through towns, but a passage through Teignmouth was unavoidable; no less than 14 overbridges were necessary to connect the streets severed by the cutting in which the railway runs through this small town. Heavy and long gradients were proposed between Newton Abbot and Plymouth, but these, it was stated in evidence, were not disadvantageous on an atmospheric railway. For the same reason several wooden viaducts of light construction were proposed, as there would be no heavy locomotives to traverse them. Prior to the atmospheric working, locomotives borrowed from the Great Western Railway were employed on the first portion of the railway (from Exeter to Teignmouth), which was opened May 3, 1846. The line was opened to Laira (Plymouth) on May 1, 1848.

The railway system was extended to the western limit of England by the Cornwall and West Cornwall Railways. The former was a broad gauge line in continuation of the South Devon Railway from Plymouth to Falmouth. It was incorporated August, 1846. Financial difficulties prevented a real start being made with the construction of the line till 1853. It was opened to Truro, 53¾ miles, by the Prince Consort on May 4, 1859. Brunel's famous tubular bridge—the Royal Albert Bridge, Saltash—is the chief engineering work; it cost £225,000. There were numerous lofty timber viaducts on the line, which was single; the gradients were also severe, at places 1 in 60. The railway was completed to Falmouth in 1863.

The West Cornwall Railway was incorporated in August, 1846, for a broad gauge line from Truro to Penzance and to absorb the Hayle Railway formed in 1834. The construction of the Cornwall Railway was so long delayed that the West Cornwall Railway was fearful of constructing the line on the broad gauge, as it would be isolated from the other 7-ft. gauge railways if the Cornwall Railway was not built, so in 1850 an Act was obtained to construct the line on the narrow gauge, with a proviso that when the Cornwall Railway reached Truro the gauge of the West Cornwall Railway was to be altered to broad, or a third line laid down to accommodate the broad gauge. The latter plan was adopted. The West Cornwall Railway was opened between Truro and Penzance in August, 1852.

The three railways that in 1844 were amalgamated as the Midland Railway were all authorised in 1836. The Birmingham and Gloucester Railway Act is dated April 22, 1836. A part of this line was opened in June, 1840, but it was not till December 17, 1840, that it was opened throughout. On it is the notorious Lickey incline, 2 miles long at 1 in 37. Eight American 4-2-0 locomotives were imported to haul the trains up this bank. Consequent upon the difference in level at Birmingham of the Birmingham and Gloucester and London and Birmingham

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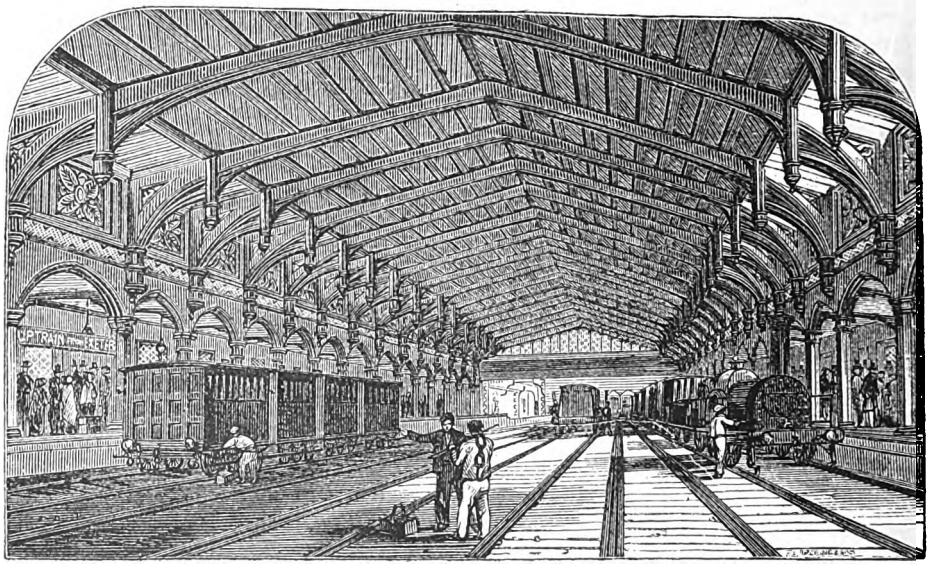

TERMINAL PORTION OF TEMPLE MEADS STATION, BRISTOL, G.W.R., IN EARLY DAYS.

(*From an Old Print.*)

Railways, the coaches of the Birmingham and Gloucester Railway reached the Lawley Street Station, Birmingham, by means of a lift until about 1847, when a junction line was opened at Birmingham.

The Birmingham and Derby Junction Railway, incorporated in 1836, was another of the companies forming the Midland Railway. The North Midland Railway was seeking incorporation in the same session of Parliament, and the object of the Birmingham and Derby Junction Railway was to join Derby and the lines radiating thence with the railways at Birmingham, which explains the word "Junction" in the title of the company. This joining or connecting of railways is the reason that "junction" appears in the names of many early railways. In view of the proposal for a Midland Counties Railway in the same session to construct a line from Derby to Rugby giving a shorter route to London than *via* Birmingham, the Birmingham and Derby Junction Railway obtained powers for a branch from Whitacre to Hampton, thus reducing the distance by rail between London and Derby and the north-eastern districts. The distance from Derby to the L. and B. Railway at Hampton was 38½ miles, and trains commenced to run between Derby and Hampton on August 12, 1838, although the L. and B. Railway was not opened throughout till five weeks later.

The Midland Counties Railway's Act of June, 1836, authorised a line from Derby to Nottingham, and a branch from Trent to the L. and B. Railway at Rugby *via* Leicester. The line was opened for traffic from Derby to Nottingham on June 4, 1839, but the Rugby section was not brought into use till July 1, 1840, thereby providing a second and shorter route between London and the places previously served by the Whitacre route. Competition with the B. and D.J.R. became acute, and fares for through passengers were reduced almost to vanishing point for the portions of the journey over the competing routes, *i.e.*, Derby and Rugby and Derby and Hampton.

The North Midland Railway also received Parliamentary sanction in 1836—on July 4. This line extended from Derby to Leeds, 72¼ miles, and considering the heavy character of the work, was constructed in a remarkably short period. There were over 200 bridges, as well as three tunnels, including Clay Cross tunnel, a mile and 24 yards in length. At Masborough the N.M.R. connected the Sheffield and Rotherham Railway near Wakefield with the Manchester and Leeds Railway,

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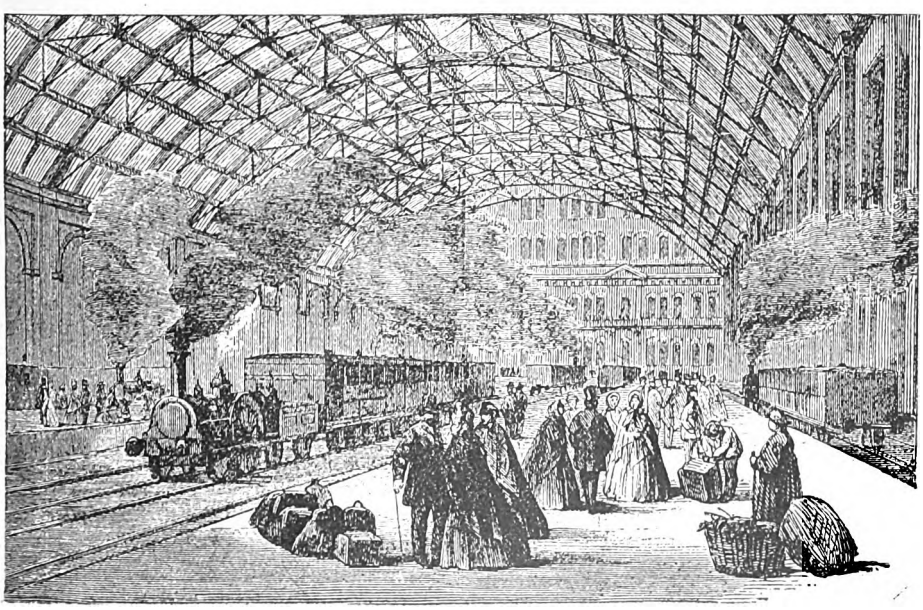
and by junctions at Altofts and Methley, with the York and North Midland Railway. The section from Masborough to Derby was opened on May 11, 1840, and the remainder to Leeds on June 30, 1840. Train control through Clay Cross tunnel, on an electric signalling system, practically the block system, is said to have been introduced in 1841. The capital of the N.M.R. was 3 millions and the line was completed for about that sum.

By means of an Act dated May 10, 1844, the North Midland, the Midland Counties and the B. and D.J.R. were amalgamated under the title of Midland Railway. A railway from York to Leeds had been promoted, but when the N.M.R. was projected it was arranged that the York line should join the N.M.R. 7 miles short of Leeds. This line was opened on June 30, 1840, and with other connecting railways, provided a continuous line of railway 217 miles long from Euston to York. Through carriages were run.

The eventful railway year 1836 saw the Royal Assent given to the South Eastern Railway Act on June 21, as the South Eastern and Dover Railway. The line as sanctioned was from Croydon to Dover, a distance of 76 miles, of which 46 miles from Red Hill to Ashford are practically straight. Connection with London from Croydon was over the Croydon and Greenwich Railways to London Bridge. In 1837 when a railway to Brighton was projected, Parliament refused to sanction a new line to the south from London, and insisted that the Brighton Railway must use already sanctioned lines as far as Red Hill. In view of difficulties likely to arise between the S.E. and L. and B. Railways over the line between Norwood and Red Hill, Parliament in 1839 arranged that the Brighton Company should construct the line and the S.E. should purchase the southern section (6 miles) for its cost of construction (£340,000), and that the two companies should have equal rights over the 12 miles. The Foord Viaduct at Folkestone, the line through the Warren beyond that town, and the tunnels thence to Dover were of a particularly heavy and expensive character, and made the construction of the railway a lengthy operation, so that it was not opened throughout till February, 1844. The first section, Redhill to Tunbridge, had been opened in May, 1842, thence to Ashford in the same year and to Folkestone in 1843.

The Taff Vale Railway was incorporated June 21, 1836, for a line chiefly for coal



CHARING CROSS STATION 60 YEARS AGO.

(From an Old Print.)

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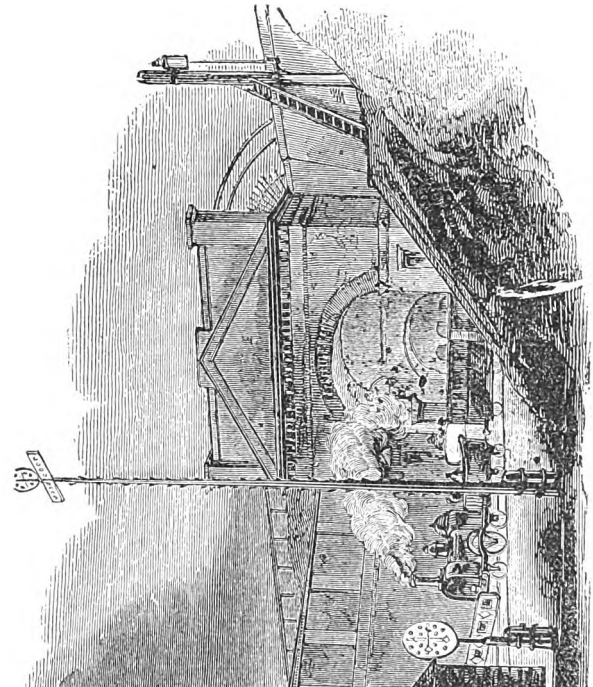

LEVEL CROSSING AT WORMWOOD SCRUBS WEST LONDON AND GREAT WESTERN RAILWAYS.

(*From the "Illustrated London News."*)

traffic from Merthyr to the Docks at Cardiff. The first section was opened October, 1840.

A section of a railway which some years later became generally known as the Great Eastern was incorporated as the Northern and Eastern Railway in July, 1836. The line commenced at Stratford, and was to have extended to Cambridge, Lincoln and York, but was only constructed as far as Newport with a branch to Hertford. The gauge was 5 ft., converted to 4 ft. 8½ in. in 1845, when the 5-ft. gauge of the Eastern Counties Railway was similarly narrowed. The first section, Stratford to Broxbourne, was opened October 15, 1840. In 1844 the Northern and Eastern Railway was leased to the Eastern Counties (G.E.) for 999 years, and vested in that railway in 1902.

The Eastern Counties Railway was another of the lines incorporated in 1836. From a London terminus at Shoreditch, authorisation for a railway through Chelmsford and Ipswich to Norwich was obtained. The line met with greater difficulties, principally financial, than any of the early trunk lines. The gauge was 5 ft. In June, 1839, 10½ miles was opened from a temporary London station to Romford, and 7 miles additional to Brentwood on July 1, 1840, on which date also the viaduct to the London terminus at Shoreditch station was brought into use. The Eastern Counties Railway never got further

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east than Colchester, 51 miles, to which place the line was opened in 1843, but by means of the Eastern Union (incorporated 1844) and the Ipswich and Bury (incorporated 1845) Norwich was reached on December 12, 1849.

Promoters of early railways rejoiced in giving long titles to their Bills, which were frequently concerned with the construction of a line but a few miles in length. The Great North of England, Clarence and Hartlepool Junction Railway was, however, an ambitious scheme for a railway from York to Newcastle.

The G.N. of E.R. Act, dated July 4, 1836, was only for a line from the Tyne to the Tees, plans for the complete line from York to Newcastle through Durham, a distance of 80 miles, not being completed till 1837, when a second Act was obtained. The capital was £1,150,000. The first section, the famous "galloping ground" from York to Darlington, 44¾ miles, was opened for passenger traffic, March 31, 1841. The construction of the northern section, on which were situate heavy engineering works, hung fire and finally a new company, the Newcastle and Darlington Junction Railway, formed in 1842, took over the completed part of the Y. and N.R. north of Darlington, and partly by means of a new route and partly by utilising portions of existing lines, through railway communication with Gateshead on the south bank of the Tyne was effected. The first train ran through from Euston to Gateshead on June 18, 1844, the departure was at 5.3 a.m., and the arrival at 2.24 p.m. The distance was 303 miles. The speed, deducting stoppages, was 37 m.p.h. Never before in the world's history had 303 miles been covered in so short a time. The Sherburn Viaduct, a wooden erection 660 ft. long and 70 ft. high, was considered a triumph of bridge building. The celebrated High Level Bridge over the Tyne, giving rail access to Newcastle from the south, was formally opened by Queen Victoria, September 28, 1849, although it had been brought into use on August 15.

The Manchester and Leeds Railway was incorporated in 1836 for a railway 50½ miles long to complete railway transportation between these towns, and for a branch to Oldham. The gauge was 4 ft. 9 in. This was the most important of the purely provincial lines sanctioned since the Liverpool and Manchester Railway. The original capital was £1,733,000. The course of the line is circuitous because of the hilly character of the district. An air line would be about 35 miles in length, but the distance by this railway was 60½ miles. The 10 miles, Normanton to Leeds, was constructed by the N.M.R., the M. and L.R. paying toll for the use of this length of line. Construction was not commenced till after the passing of an Amending Act in 1837, which improved the course of the railway. In 1839 an extension was authorised from the Manchester terminus in Oldham Road to Hunts Bank to there join an extension of the Liverpool and Manchester Railway. The first section of the railway, 13½ miles long, from Manchester to Littleborough, was opened in July, 1839, at the other end the line from the junction with the N.M.R. at Normanton to Hebden Bridge, 27½ miles, was opened on October 5, 1840. The completion of the Littleborough tunnel, 2,869 yards long, delayed the opening of the line throughout till March 1, 1841. The sleepers on the line through this tunnel were laid only 2 ft. 6 in. apart. The tunnel cost £251,000 instead of £143,000 as estimated. The line for some distance runs along the valley of the Calder, and crosses that river several times. Deep and extensive cuttings were excavated at Horbury and Sowerby Bridge. The 1½ mile branch to Heywood, costing £10,000, was constructed without Parliamentary sanction. About £2,864,000 was spent on constructing and equipping the Manchester and Leeds Railway. From the first the number of passengers carried on the M. and L.R. was extraordinarily heavy.

The first railway with non-stop trains between termini, and from intermediate stations to termini, was incorporated July 28, 1836. In its Act the railway was called the Commercial Railway. The capital with loans was £800,000 for a railway from Minories, near the Tower of London, to a steamboat pier on the Thames at Blackwall, a distance of 3½ miles. The line was mostly built on a viaduct. In 1837 powers were obtained to extend the western end ¼ mile to Fenchurch Street, and the name was changed to London and Blackwall Railway. The line was

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opened July 6, 1840. Rope haulage was employed, and three classes of passengers were carried. A train consisted of one or more carriages for each station, the rear coach being detached in speed at the first station and so on, the front carriages running through to the terminus, carriages for the terminus were attached to the traction rope at intermediate stations. The two lines were each used for up and down trains alternately. The gauge was 5 ft. 0½ in. Rope haulage gave place to locomotives early in 1849 at a cost for alterations and locomotives of £43,784. In 1865 the L. and B.R. was leased to the G.E.R. for 999 years; it is now part of the L. and N.E.R.

The Lancaster and Preston Railway, incorporated in 1837 for a railway 20½ miles long to connect these towns, was a further step in effecting railway communication with Scotland by means of a west coast route. The authorised capital was £333,000, but it cost about £450,000 to build the line, which was opened June 26, 1840. The North Union Railway provided locomotive power. From the opening two through trains were run daily in each direction between Euston and Lancaster, 239 miles, and by two other trains each way, through carriages were provided.

In 1844 the Lancaster and Carlisle Railway was incorporated to continue the west coast route northward 70 miles to Carlisle, there to join the Caledonian Railway. At Carlisle a joint station was erected. The line from Lancaster to Kendal was opened September 22, 1846, and throughout to Carlisle on December 17, 1846. In 1849 the L. and P. and L. and C. Railways were amalgamated, and the L. and N.W.R. worked the line under contract, 1s. per mile per passenger train, not exceeding 11 carriages, and 1s. 2d. per mile per goods train of 130 tons. The L. and C.R. expended about £1,525,000 upon its line. The railway was in 1859 leased for 900 years by the L. and N.W.R.

NOTTINGHAM STATION, M.R., IN EARLY DAYS.

(*From Williams' "The Midland Railway."*)

A small railway which was able to keep its independence until the grouping was effected in 1923, and moreover paid dividends during an unbroken period of 72 years, was incorporated in 1837. The line in question, 28 miles in length, was the Maryport and Carlisle Railway, constructed to connect the towns named, with a capital of £240,000. The first section from Maryport Harbour to collieries near Aspatria, 7¼ miles, was opened July 15, 1840, and the whole line on May 10, 1845. From 1870 to 1882 (except 1878, when the dividend was 10 per cent., and 1879, 8¾ per cent.) the dividends were never

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less than 10½ per cent., and in 1873 reached 13 per cent.

The London and Brighton Railway Act was obtained in 1837 for a line from the S.E. and D.R. at Red(stone) Hill to Brighton a distance of 29¾ miles with a branch, 5½ miles in length, from Brighton to Shoreham. Connection between Red Hill and London over the S.E. Croydon and Greenwich Railways is explained on page 133.

The immense sum of £172,000 was expended by the L. and B.R. in obtaining its Act. A capital of £2,400,000 was provided for but the line was expected to be built and equipped for £1,120,000. The gauge was 4 ft. 9 in. The Shoreham branch was the first section opened (May 12, 1840), through railway communication between London and Brighton being effected on September 20, 1841.

Chester was provided with railway communication on October 1, 1840. The Chester and Crewe Railway was sanctioned in 1837 for a line 20½ miles in length. The capital by 1840, in which year the C. and C. was amalgamated with the Grand Junction Railway, amounted to £458,333. The aqueduct carrying the Ellesmere Canal across the railway at Christleton was 85 years ago considered a remarkable example of engineering. In 1837 the Chester and Birkenhead Railway, 14½ miles long, was sanctioned; it was opened September, 1840.

Manchester was far from satisfied with the railway route to London *via* the Grand Junction Railway, with a run 15 westward over the L. and M.R. before a turn was made to the south, and in 1837 the Manchester and Birmingham Railway was incorporated for a line from Manchester to the G.J.R. at Chebsey, a distance of 45½ miles. The line was to pass through Stockport and Stone, with a branch to Crewe. The capital was £2,850,000. The main line included many extensive and expensive engineering works. One, an immense viaduct over the Dane at Congleton was under construction when in 1839 an agreement was made between the M. and B. and G.J. Railways under which the construction of the line of the former through Stone to Chebsey was abandoned, and only the 30½ miles, Manchester to Crewe, was constructed. This included the Stockport Viaduct of 48 arches, 111 ft. high and of a total length of 1,792 ft., and a viaduct over the Dane, 1,717 ft. long. The line was opened, Manchester to Stockport, June 4, 1840. and through to Crewe, August 10, 1842, The gauge of this line was 4 ft. 9 in.

The Trent Valley line of the L. and N.W.R. through Tamworth avoiding Birmingham, was opened in June, 1847.

A small Scottish railway was incorporated in 1837 which became the nucleus of two important Scottish systems—the Caledonian and the G. and S.W. The line was the Glasgow, Paisley and Greenock, authorised to make a line 22½ miles in extent from Glasgow to Greenock. The capital was £553,333. In the same year the Glasgow, Paisley, Kilmarnock and Ayr Railway obtained its Act. The line for the first 7 miles (Glasgow to Paisley) was the joint property of the two companies managed by a joint committee, and so far as our research has extended this appears to be the first "joint railway." The joint line was opened July 13, 1840. The viaduct through the burgh of Paisley "excited much admiration for its magnitude and beauty." The G.P. and G.R. was opened to Greenock, March 30, 1841. There were two tunnels through exceedingly hard whinstone, 960 ft. and 1,020 ft. long, separated by a short cutting 70 ft. deep; although 1,000 men and three steam engines were employed, the progress at times did not exceed 6 in. per day. Including half cost of the joint line the G.P. and G.R. cost about £625,000 to construct. The G.P.K. and A.R. was opened throughout on August 12, 1840, and prior to the grouping was part of the G. and S.W.R.

The Edinburgh and Glasgow Railway was incorporated in 1838 to connect the national and commercial capitals of Scotland. This 46 miles of railway was opened February 21, 1842. At the Glasgow end is a steep decline to the Queen Street terminus, at first worked by stationary engines, then for a short time (1844–46) by locomotives, and again by rope traction till 1908 when locomotive working was substituted.

In 1828 a horse railway 9 miles long was incorporated as the Bristol and Gloucestershire Railway, with a capital of £57,000. This mineral railway was opened in 1832. The Great Western Railway obtained an interest in this line, and in 1839 powers

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were obtained to extend the line to near Gloucester, a further 22 miles (*i.e.*, to a junction with the Cheltenham and Great Western Union Railway at Standish). On the original section locomotives were to be substituted for horses and the gauge altered to 7 ft., whilst the title was changed to Bristol and Gloucester Railway. The line was opened July 6, 1844. After the opening of the line the G.W.R. shares were disposed of, and gradually the narrow gauge partizans obtained control of the line. From March, 1845, the Bristol and G.R. and the Birmingham and G.R., which were seeking an amalgamation, were worked under one management and by Act of August 3, 1846, both were amalgamated with the Midland Railway.

During the period from 1830 to 1843 numerous small railways had been sanctioned, whilst established companies had obtained powers to construct many branches, so that the railway system of the country as we know it was at least supplied with most of its main framework and many of its connecting members.

1844 saw a further extensive advance in railway incorporation; 7 & 8 Vic. cap. 65, sanctioned the Chester and Holyhead Railway, 85 miles long, including the

CALEDONIAN RAILWAY TIME TABLE,

ON AND AFTER 10TH SEPTEMBER, 1847

(Until further Notice.)

CARLISLE AND BEATTOCK.

NOTICE.—*The Doors of the Booking Offices will be Closed punctually at the Hours fixed for the Departure of the Trains, after which no Person can be admitted.—Passengers, to ensure being booked, should arrive at the Stations and obtain their Tickets Ten Minutes earlier than the Times mentioned in the following Table.*

Distance.	Edinburgh and Glasgow to Carlisle, &c.	CLASS 1 2 & 3	CLASS 1 & 2	CLASS 1 & 2
	EDINBURGH by Coach	..	A.M. 7 0	P.M. 4 30
	GLASGOW do.	..	5 15	2 30
Miles.	Trains leave	A.M.	P.M.	
5	BEATTOCK	6 30	1 0	10 30
10¾	WAMPHRAY	6 45	1 15	--
17¼	NETHERCLEUGH	7 5	1 21	
19½	LOCKERBIE	7 15	1 45	11 15
26½	ECCLEFECHAN	7 20	2 0	11 30
31	KIRKPATRICK	7 50	2 20	--
35½	GRETNA	8 5	2 35	...
39½	ROCKCLIFF	8 15	2 45	
	Arrive at CARLISLE	8 30	3 0	12 30
		P.M.		A.M.
	PRESTON	1 25	7 53	5 10
	MANCHESTER	3 5	...	6 35
	LIVERPOOL	3 15	9 45	6 45
			A.M.	P.M.
	LONDON	..	5 32	1 0

Distance.	Carlisle, &c. to Edinburgh and Glasgow.	CLASS 1 & 2	CLASS 1 2 & 3	CLASS 1 & 2
	Trains leave	P.M.	A.M.	A.M.
	LONDON	8 45	....	10 0
	LIVERPOOL	..	7 30	3 50
	MANCHESTER	....	7 40	4 0
	PRESTON	5 35	9 38	5 35
Miles.		A.M.	P.M.	P.M.
	CARLISLE	10 0	2 30	10 10
4	ROCKCLIFF	10 12	2 42	..
8½	GRETNA	10 25	2 55	10 45
13	KIRKPATRICK	10 40	3 10	
20	ECCLEFECHAN	11 0	3 30	11 10
22½	LOCKERBIE	11 15	3 45	11 25
28½	NETHERCLEUGH	11 25	3 55	--
34½	WAMPHRAY	11 47	4 15	..
39½	Arrive at BEATTOCK	12 0	4 30	12 0
	EDINBURGH by Coach	6 P.M.		6 A.M.
	GLASGOW by Coach	7 43		7 33

FARES.

	First Class and Inside Coach.	Second Class and Outside Coach.
Between GLASGOW AND CARLISLE	30/6 ..	20/
.. EDINBURGH AND CARLISLE	29/6 ..	.. 19/6
.. CARLISLE AND BEATTOCK	8/6 First Class	5/6 Second Class. 3/4 Third Class.

** The Company will not be answerable for any Luggage, unless Booked and Paid for; and, for better security, Passengers are recommended to take Carpet Bags and small Packages inside the Carriages, and to have their address written on all their Luggage in full.—Children under Ten Years of Age, Half Price; Children in arms, unable to walk; pass Free.

HORSES.—Grooms in charge of Horses to pay Second Class Fares.—The Company will not be liable in any case for loss or damage to any Horse or other Animal above the value of £40, unless a declaration of its value, signed by the Owner or his Agent at the time of booking, shall have been given to them, and by such declaration the Owner shall be bound; the Company not being in any event liable to any greater amount than the value so declared. The Company will in no case be liable for injury to any Horse or other animal, of whatever value, where such injury arises wholly or partially from fear of restiveness.—If the declared value of any Horse or other animal exceed £40, the price of conveying will, in addition to the regular fare, be after the rate of 2½ per cent., or 6d. per pound upon the declared value above £40, whatever may be the amount of such value, and for whatever distance the Horse or other Animal is to be carried.

CARRIAGES.—Passengers travelling by the Railway with Private Carriages are charged First Class, and their Servants, Second Class Fares; and corresponding Tickets are issued for each Class, which are also available for the Company's Carriages. To prevent mistakes, Passengers are requested to declare in each case the number of Servants to whom Second Class Tickets are to be issued.

N.B.—The Servants of the Company are prohibited from demanding or receiving any Gratuity from Passengers, who, it is hoped, will assist the Directors in enforcing this Regulation. Immediate dismissal follows the discovery of any Servant of the Company receiving any Gratuity.

** *Smoking in the Carriages and at the Stations is forbidden, under a Penalty, by Act of Parliament.*

Trains marked thus (*) do not run on Sundays.

Booking Office in EDINBURGH, Nos. 2 & 10, Prince's Street.
... ... GLASGOW, Walker & Co., Tontine Hotel, and A. Mein and Co., Trongate.

By Order,

J. W. CODDINGTON,
Secretary

AN ORIGINAL CALEDONIAN RAILWAY TIME-TABLE.

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celebrated tubular bridge across the Menai Straits together with a small similar bridge at Conway. These bridges were at the time of their completion described as "the most astonishing engineering achievement on any railway." The cost of the two bridges was about £745,000. The first section from Chester to Conway was opened May 1, 1848, whilst railway communication to Holyhead was effected through one tube of the Britannia Bridge on March 18, 1850, and the double line across the Menai Bridge was opened October 19, 1850. The total expenditure of of the railway, including £167,000 for steamers for the Irish service, was about £3,930,000. The L. and N.W.R. provided about a third of the capital and worked the line. In March, 1859, the Chester and Holyhead Railway was amalgamated with the L. and N.W.R.

On July 19, 1844, the North British Railway was incorporated to construct a line from Edinburgh to Berwick, there to effect a junction with the Newcastle and Berwick Railway. The line was opened in June, 1846. The gradients were fairly easy except through the Carlton Tunnel, Edinburgh, where the rise is 1 in 78 for about a mile, and near Cockburnspath where for 4 miles the gradient is 1 in 96.

In 1845 the commencement of the Waverley route was sanctioned, *i.e.*, the Edinburgh and Hawick Railway, 43½ miles long. Of this section it was said the "curves are sharper and more numerous than on almost any other line." After many unsuccessful applications Parliament in 1859 sanctioned the Border Union Railway by which the Waverley route was completed to Carlisle, thus giving the N.B.R. communication with the West Coast route The line was opened to Carlisle in July, 1862.

In 1845 the Newcastle and Berwick Railway was incorporated. It was an extension of the Newcastle and Darlington Railway northward to the Scottish border. The N. and B.R. took over the Newcastle and North Shields Railway, 6¾ miles, sanctioned in 1836 and opened in 1839. The first section (14½ miles) of the N. and B.R. was opened March 1, 1847, and by means of a temporary viaduct over the Tweed, railway communication was effected with Berwick on October 10, 1848, thus completing the East Coast route from Euston *via* Rugby between the capitals of England and Scotland. The Royal Border Bridge, Berwick, was opened on August 29, 1850.

An important, but short, addition to the Lancashire railway system was made by the incorporation of the Manchester, Bury and Rosendale Railway in 1844, with an original capital of only £300,000, which by 1846, by additions and amalgamations, had reached nearly £4,000,000, and had become the East Lancashire Railway. The original line was opened September 28, 1846; Liverpool was reached April 2, 1849, and Preston September 1, 1850.

The Monmouthshire Railway and Canal was incorporated July, 1845, the railway extending from Newport to Pontypool. Several old tram roads were taken over with the canal. The Act of this company contained many unusual financial clauses, and the inability of the company to convert the tramroads to trainroads within the time specified in the Act led to litigation. In later years mileage increased and the railway became successful. It was amalgamated with the G.W.R. August 1, 1880.

In 1845 extensive extensions of the broad gauge system were authorised. The South Wales Railway was incorporated August 4 for a line from Chepstow to Pembroke Dock and Fishguard, with a branch from Newport to Monmouth. In 1846 powers were obtained to extend the line from Chepstow to Grange Court, so obtaining communication with the existing broad gauge lines. The line was then leased to the G.W.R. for 999 years. By 1851, 213 miles of S.W.R. lines had been authorised. The first section, Chepstow to Swansea, was opened June 18, 1850, and from the east bank of the Wye to Grange Court on September 18, 1851. One tube of the Chepstow tubular bridge across the Wye was completed June 14, 1852, enabling through trains to be run between London and South Wales. The bridge has three spans, each of 100 ft., and one of 290 ft., making the total length with the three river piers 610 ft. There was a timber viaduct, 160 ft. high and a mile long, near Landore. Powers were obtained in 1852 to make Milford Haven the western terminus instead of Fishguard, and the line was opened to the former in 1856.

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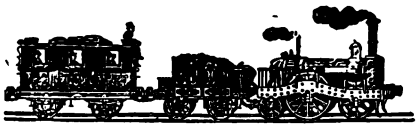

MARYPORT AND CARLISLE RAILWAY.

ON and after Tuesday the 25th of May Five Trains will run daily between Maryport and Aspatria, as under,–

From Maryport.	*From Aspatria.*
Half-past 5, A. M.	Half-past 6, A. M.
Half-past 8, A. M.	Half-past 9, A. M
11, A. M.	12, Noon.
Half-past 1, P. M.	Half-past 2, P. M.
4, P. M.	5, P. M.

N. B. On Tuesdays and Fridays the Second Train in the Morning will leave Maryport at 8 o'Clock, and Aspatria at 9, and the Afternoon Trains will leave Maryport at 2 and 5, and Aspatria at 3 and 6.

☞ An Omnibus, starting from the King's Arms, Wigton, at 8 o'Clock in the morning (except on Tuesdays and Fridays, when it will leave at half-past 7,) will meet the 2nd Train at Aspatria, exchanging Passengers, and returning direct to Wigton, arriving there at 25 minutes past 10, except on Tuesdays and Fridays, when the Omnibus will reach Wigton at 10.

FARES.

Between Maryport and Wigton,	First Class	3*s.* 6*d.*	Second Class	2*s* 6*d.*
Bull Gill,	do	do.	2*s.* 9*d.*	do.	2*s.* 3*d.*
Arkleby, Aspatria,	do.	do,	2*s.* 6*d.*	do,	2*s.*

By order,
W. MITCHELL, Secretary.

Railway Office, Maryport, May 24th, 1841

JOSEPH OSTLE, PRINTER.

FIRST TIME-TABLE ISSUED BY THE MARYPORT AND CARLISLE RAILWAY.

The Oxford, Worcester and Wolverhampton Railway was authorised in August, 1845, for a line from the G.W.R. near Oxford to Wolverhampton through Worcester. Between Oxford and Abbots Wood (where junction was to be made with Birmingham and Gloucester Railway) the line was to be broad gauge exclusively and mixed gauge over the remainder. The most strenuous parliamentary and legal battles were fought for several years between the broad and the narrow gauge partisans over this line and other proposed railways between Oxford, Birmingham, Shrewsbury and Chester. Portions of the line were opened in 1852, and on May 7, 1853, the line from Wolvercot Junction, Oxford, to Evesham was opened, enabling broad gauge trains to be run between London and Dudley.

The broad gauge line to Birmingham, by means of the Birmingham and Oxford Junction Railway *via* Banbury, was opened September 30, 1852. As a result of the fight between the broad and narrow gauge partisans, the mixed gauge was laid on the line between Oxford and Birmingham, as well as on the O.W. and W.R. The latter railway, which was worked independently of, and in opposition to, the G.W.R., in August, 1859, obtained parliamentary sanction to abandon the broad gauge, which was quickly done. Meanwhile, the O.W. and W.R., by alliance with the Severn Valley Railway, formed in 1853 to construct a line 40 miles long from Hartlebury to Shrewsbury; the Newport, Abergavenny and Hereford, 33 miles long, incorporated in 1846; and the Worcester and Hereford line, 30 miles long, incorporated in 1853, became the West Midland Railway in 1860, by the amalgamation of these lines. The West Midland Railway was open to sell itself to either the broad or narrow gauge. From July 1, 1861, the G.W.R. leased it for 999 years, but the lease required the G.W.R. to lay down the narrow gauge from Reading (to which it had already been extended from Oxford) to Paddington and Brentford. This was speedily done, and narrow gauge trains ran from Paddington on October 1, 1861, and during 1869 all broad gauge lines north of Oxford were removed.

The Caledonian Railway was incorporated July 31, 1845, by 8 and 9 Vict., cap. 162, for a line from Carlisle (there joining the west coast system of railways from London) to Castle Cary, with branches from Carstairs to Edinburgh and Glasgow. On this line is the severe Beattock bank, 9¾ miles long, with an average gradient of 1 in 75. The section Carlisle to Beattock, 39¾ miles, was opened September 10, 1847, and on February 15, 1848, the line was completed to both Edinburgh and Glasgow, thus completing the first all-rail route between London and Edinburgh and Glasgow.

At Castle Cary the Caledonian Railway joined the Scottish Central Railway (incorporated the same day as the former). The S.C.R. also joined the Edinburgh and Glasgow Railway at Falkirk. The system extended thence northward to Perth, to

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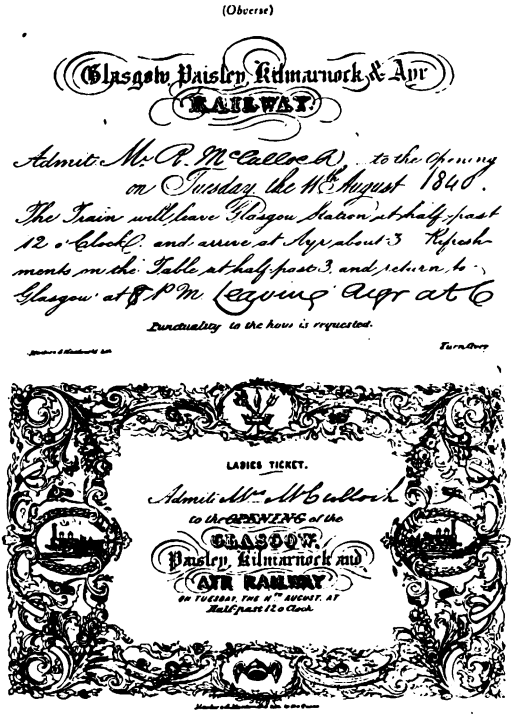
which town it was opened in May, 1848. At Perth connection was made with the Scottish Midland Junction Railway (also incorporated on July 31, 1845) for a line from Perth to Forfar, there to join the Aberdeen Railway. This line was opened September 11, 1848. July 31, 1845, was an important date in the annals of the Caledonian Railway; on that date was incorporated yet another line—the Aberdeen Railway—which was the fourth company incorporated that day. These lines eventually formed the Caledonian Railway. The Aberdeen Railway consisted of a line from Guthie (on the Arbroath and Forfar Railway, which was leased by the Aberdeen Railway) to Aberdeen. Railway communication was effected with Aberdeen in April, 1850, thus completing the West Coast route from London to the "granite city." It may be as well here to refer to the completion of the early main railway system of Scotland, although some of the line chronologically falls at later dates.

The Edinburgh and Northern Railway was incorporated in 1845 for a railway from Burntisland on the north bank of the Forth, through Ladybank to a junction with the Scottish Central Railway near Perth, and a branch through Cupar to the south bank of the Tay at Port-on-Craig with a ferry to Dundee. A ferry also provided communication across the Forth to Granton, whence Edinburgh was reached by the Edinburgh, Leith and Granton Railway, incorporated in 1836. These lines became the Edinburgh, Perth and Dundee Railway in 1847. The line between Burntisland and the south bank of the Tay was opened in September, 1848. The East Coast Railways at first reached Aberdeen by means of the Dundee and Arbroath Railway, incorporated in 1836 and opened 1840, and the Arbroath and Forfar (incorporated 1836, constructed on the 5-ft. 6-in. gauge, and later converted to standard gauge). At Forfar, a junction was effected with the Aberdeen Railway, which in 1848 leased the Arbroath and Forfar Railway. The Aberdeen Railway falling into the Caledonian Railway system caused the North British Railway to seek an independent approach to Aberdeen, but it never reached this objective, the 38 miles from Kinnaber Junction to Aberdeen being by means of running


(Obverse)

Glasgow Paisley, Kilmarnock, & Ayr
RAILWAY.

Admit Mr. R. McCallum to the Opening on Tuesday the 4th August 1848.
The Train will leave Glasgow Station at half past 12 o'Clock and arrive at Ayr about 3. Refreshments on the Table at half past 3 and return to Glasgow at 8 P.M. Leaving Ayr at 6
Punctuality to the hour is requested.

LADIES TICKET.
Admit Mrs. M'Culloch
to the OPENING of the
GLASGOW,
Paisley, Kilmarnock and
AYR RAILWAY
on TUESDAY, THE 4TH AUGUST, AT
Half past 12 o'Clock.

INVITATION TICKET, OPENING OF GLASGOW, PAISLEY, KILMARNOCK AND AYR RAILWAY.

powers. The North Eastern Railway route from Arbroath to Kinnaber Junction was opened May 1, 1883.

Northward from Aberdeen rail communication was provided by the Great North of Scotland Railway, which was incorporated in 1847 for a line to Inverness. Construction was not commenced until 1852, the first section, 40 miles of single line to Huntly, was opened September, 1854. The grandiose title of the little line is explained by the fact that it was incorporated to be amalgamated with the Aberdeen Railway, but this arrangement was abandoned in 1866. The Great North of Scotland Railway never got nearer Inverness than Elgin, but in 1858 Inverness became accessible by means of the Highland Railway's line to Keith. The Great North of Scotland Railway never provided second-class accommodation.

The Highland Railway had its origin in the Inverness and Nairn Railway incorporated in 1854 and opened November, 1855. Extension southward was by the Inverness and Perth Junction Railway, incorporated in 1861, for a line from Forres

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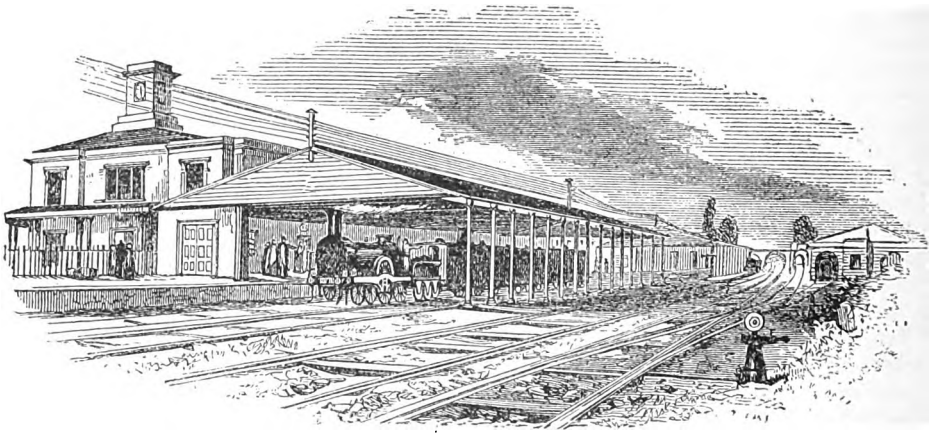
to Dunkeld, 103½ miles, opened July, 1864. From Dunkeld, the Caledonian Railway was reached at Stanley Junction over the Perth and Dunkeld Railway, 8¾ miles long, incorporated in 1854, and opened April, 1856. Extensions to the extreme north were :—By the Ross-shire Railway from Inverness to Bonar Bridge (opened 1865), thence in 1868, to Golspie by the Sutherland Railway, which was continued to Helmsdale in 1871, by the Duke of Sutherland's Railway, and from Helmsdale to Wick and Thurso in 1874 by the Sutherland and Caithness Railway. The title Highland Railway was assumed by Act on June 29, 1865.

Of railways in the south of Scotland, we have already mentioned the Glasgow, Paisley, Kilmarnock and Ayr. The Glasgow, Dumfries and Carlisle Railway was incorporated in 1864 for a line from the Caledonian Railway, near Gretna through Annan to the G.K. & A.R., near Old Cumnock. The line from Gretna to Dumfries, 24 miles, was opened in August, 1848, and throughout to Cumnock, an additional 41 miles, on October 28, 1850. The title Glasgow and South Western Railway was assumed by statute on this date.

There now remains but one of the big trunk lines to mention—the Great Northern. The Great Northern Railway, incorporated in June, 1846, was an amalgamation of two rival schemes—the London and York and Direct Northern. The main line was 162¾ miles long from King's Cross, London, to a junction at Askern with the Lancashire and Yorkshire Railway; over that line to Knottingley, and thence by Y. & N.M.R. to York, the original idea of an independent line from Askern to York being abandoned when the above running powers were obtained. There was also a loop line from Peterborough through Lincolnshire rejoining the main line at Retford, over the M.S. & L. from Sykes' Junction. Sections in Lincolnshire were first opened for traffic, whilst the completion of the line from London to Peterborough on August 7, 1850, enabled trains to run through from King's Cross to York, *via* the Lincoln loop. The 62 miles of main line from Peterboro' to Retford was opened July 15, 1852, thus completing the direct route to York. Apart from its important position amongst the East Coast Railways, the Great Northern Railway from the first obtained further prominence because of important towns in Yorkshire it served by means of running powers.



SLOUGH STATION, G.W.R., IN THE 'FIFTIES.

(*From an Old Woodcut.*)

A line intended merely to extend the North Kent branch of the South Eastern Railway through Chatham and Faversham to Canterbury, 29 miles in length, was incorporated under the title of the East Kent Railway in August, 1853. The first section, Chatham to Faversham, was opened February 28, 1858, and thence to Canterbury, July 18, 1860. Meanwhile extensive additions, eastward to Dover and Ramsgate, and westward to London were sanc-

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tioned, and the provincial East Kent Railway became the short trunk line known as the London, Chatham and Dover Railway. The financial conditions under which the London, Chatham and Dover Railway was constructed raised the cost of the line enormously, so much so that it is only during the past 30 years that country lines may be said to have approached in cost that of the London, Chatham and Dover Railway. After duplicating routes to every place of importance in Kent save Tonbridge and Folkestone, Parliamentary sanction was obtained for the South Eastern and London, Chatham and Dover Railways to be worked as one system. The South Eastern and Chatham Railway dates from January 1, 1899. The capital of the two companies was kept distinct until the formation of the Southern Railway.

By 1860 practically the whole of the trunk lines of the country had been sanctioned. Numerous amalgamations, chiefly of contiguous and continuous railways, had taken place, so that the nucleus of the systems existing at the date of grouping (1923) were in existence, although important absorptions took place after 1860. Amongst systems which upon amalgamation took new names were :—the L. and N.W.R. in 1846, Lancashire and Yorkshire in 1847, North Eastern in 1854, and Great Eastern in 1862—the London section of which was previously known as the Eastern Counties.

The Metropolitan Railway, the first "underground" and forerunner of the "tubes," was incorporated in 1853 as the North Metropolitan, and re-incorporated in 1854 under its present title. The line was originally on the mixed gauge, the G.W.R. working broad-gauge trains overit, and was opened January 10, 1863. In 1864 the Metropolitan District Railway was incorporated for the completion of the "inner circle." The lines from Kensington to the Mansion House were completed July 3, 1871, but it was not until October 6, 1884, that the whole inner circle was opened. The first London Tube, the City and South London, was opened in December, 1890, and the last (apart from extensions) the Charing Cross, Euston and Hampstead, in June, 1907.

The Mersey Railway, connecting Liverpool and Birkenhead by means of a tunnel beneath the river, although sanctioned in 1866, was not opened till February 1, 1886. The line was electrified May, 1902.

Important extensions by early railways, in some cases completely altering the character of the railway, need to be chronicled. An extension of the Midland Railway through Bedford from Leicester to Hitchin, 62 miles long, opened in May, 1857, gave this railway access to London by running powers over the G.N.R. A new line from Bedford to St. Pancras, opened October 1, 1868,* gave the Midland Railway an independent route access to the metropolis and removed it from the list of provincial railways to that of trunk lines. A somewhat similar, but even more ambitious, development of the M.S. and L.R. resulted in that line reaching London from Annesley through Nottingham and Rugby, and over the Metropolitan Railway from Aylesbury. The name of the company was changed to Great Central Railway in August, 1897, and the line was opened to its Marylebone terminus in March, 1899.

The history of the lines forming the N.B.R. north of the Forth shows the difficulty the East Coast railways had in reaching Central and Northern Scotland. The Forth could be circumvented by a *detour* and running powers to Stirling, but such facilities did not exist with regard to the Tay. Powers were therefore obtained in 1870 to build a railway bridge across the Tay to Dundee with connecting lines ; the capital was £466,600. The bridge was completed and opened June 1, 1878. On December 28, 1879, the structure gave way under the stress of a strong gale, and a train crossing it was submerged and every passenger and official in it were drowned. An Act for a new bridge was obtained in 1881, and this second and more substantial Tay Bridge was opened June 13, 1887. The Act for the Forth Bridge was obtained in 1873, but it was not until after the Act of 1882 that any progress was made ; the stupendous structure was commenced in 1883 and opened March 4, 1890.

The West Highland Railway—a line under the N.B.R. auspices from the Glasgow district to Mallaig, on the west coast—was incorporated in 1889 and opened

* To and from Moorgate Street, over the Metropolitan Railway, Midland trains had run since July 13, 1868.

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August, 1894. The main line and branches, 142 miles in length, were constructed partly under a Government guarantee and subsidy.

The Hull, Barnsley and West Riding Junction Railway was incorporated in 1880, and opened in July, 1885.

The Severn Tunnel, a famous subaqueous engineering achievement, successfully completed in the face of great difficulties, gave the G.W.R. a shorter route between London and South Wales. The Severn Tunnel, 4 miles 624 yards long—much the longest in Great Britain—was opened for traffic September 1, 1886. Construction of direct lines between Patney and Westbury and Castle Cary and Durston enabled the G.W.R. to shorten its route between London and Taunton and places west of the latter by 20 miles in 1906, whilst the opening of the Ashendon-Aynho line, in 1910, reduced the distance between London and Banbury and places north of the latter by the G.W.R. route by 19 miles. Many other "cuts off" have been made by various railways; important are the direct line to Tonbridge through Sevenoaks by the S.E.R., opened in 1868, saving 13 miles to Hastings, Dover, &c., and the Inverness-Aviemore line of the Highland Railway, opened November, 1898.

The extent of the British railway system has been increased by various joint lines, the most extensive being the Cheshire Lines, Somerset and Dorset, G.N. and G.E., and Midland and G.N. With a total length approaching 20,400 miles, the various railways, excluding some of purely local character, tubes and narrow-gauge lines, were, by means of the Railways Act, 1921, welded into four systems—the Great Western, 3,795 miles; L. and N.E., 6,714 miles; L.M. and S., 7,525 miles; and the Southern, 2,199 miles.

GREAT SOUTHERN & WESTERN RAILWAY (IRELAND).

Photo.] [*J. Macartney Robbins.*

REBUILT 4-4-0 LOCOMOTIVE No. 321 LEAVING KINGSBRIDGE STATION, DUBLIN.

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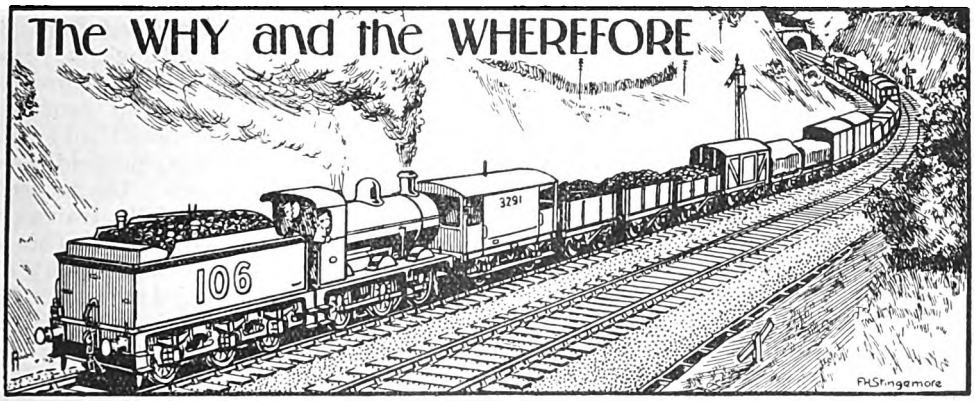

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications for information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 33, *Tothill Street, Westminster, London, S.W.*1. *No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book"* (5*s. net*) *should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

Huntingdon Junction, L. & N.E.R.

The junction at Huntingdon between the late G.N.R. and G.N. and G.E. Joint Lines has an interesting history. In 1846 the Ely and Huntingdon Railway was formed to construct a railway between these towns; by 1851 the only portion finished was between Huntingdon and St. Ives. The E. and H.R. had become part of the East Anglian Railway and the latter worked the Huntingdon–St. Ives line by horses, but G.E.R. trains worked over it to and from Cambridge. In 1851 the G.N.R. arranged to work the E.A.R., and the latter constructed the junction, 6 chains long, at Huntingdon to enable the G.N.R. to do so. The portions of the E.A.R. at Wisbech were separated by a few chains of G.E.R. line, and the latter refused to allow G.N. trains to pass over it, so passengers had to be conveyed by 'bus between the two sectons of the E.A.R. at Wisbech.

In 1852 the Eastern Counties Railway took over the working of the E.A.R. and the G.N. trains were withdrawn. The E.A., E.C. and other railways were amalgamated as the G.E.R. The G.E.R. made use of the Huntingdon junction to exchange certain traffic with the G.N.R. In 1878 the G.N. and G.E. Joint Railway was formed, and from the opening of the Joint Line in 1882 the line between Huntingdon and St. Ives also became G.N. and G.E. Joint. Traffic that had formerly passed from one system to the other at Huntingdon henceforth usually reached destination over other sections of the Joint Line, leaving little interchange at Huntingdon.

[Reply to "BATHONIAN."]

Permanent Way Signs, G.W.R.

The lettering on the board to which you first direct attention indicates in one case the month and year when the section was relaid, while R E S indicates re-sleepered, the month and year also being shown. At places where rails are canted, as on curves, short posts are used, the numeral indicating the cant of the rail in inches. These are known as cant boards. There are also gang boards, marking the commencing and terminating-points of the section under the charge of each gang. These boards state the gang number, an arrow pointing in the direction of the length. We have been unable to identify the board bearing a black five-pointed star mentioned by you. It is suggested that posts placed near Shrivenham are thus marked to indicate a measured mile there. We are indebted to officers of the

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Great Western Railway for the above information, in regard to which special trouble has been taken.

[Reply to E. H.]

Plymouth, Devonport and South Western Junction Railway.

Reference to the locomotives used on this line was contained in an article published in the January, 1917, number of the RAILWAY MAGAZINE, but more extended particulars were included when the line was first described in the February, 1908, number. Both of these issues are, however, long since out of print. From the 1908 article we gather that the 0-6-0 tank engines had 4-ft. coupled wheels and outside cylinders 14 in. by 22 in. The goods locomotives, of the 0-6-2 type, had coupled wheels 4 ft. diam. and outside cylinders 14 in. by 24 in. The L.S.W. 4-4-0 engines of the "395" class correspond generally to the "421" class, except that the coupled wheels have a diameter of 6 ft. They were originally designed for the Portsmouth route, and, after being used to some extent on the western lines, now seem to deal with a large proportion of the Portsmouth line traffic.

[Reply to B. Y. WILLIAMS.]

Steeply-Graded Main Lines.

In that very fast trains are worked over the exceptional gradients between Newton Abbot and Plymouth, it may be correct to describe the Great Western West of England main line as including the hardest as well as the easiest gradients, though the route now taken by the through expresses *via* Westbury is by no means so easy as the old main line through Swindon. It is necessary, however, to take into account the inclusion, in the Midland west to north main line, of the Lickey incline, and, in any case, comparisons of this kind can have little value, in that, to make them, it is necessary to take into account so many factors. Obviously, no definite answer can be given to your enquiry as to which section of any British railway passes through the finest scenery.

[Reply to T. W. LINSELL.]

L.M.S. (Midland) Anglo-Scottish Services.

Services run from London to Glasgow and Edinburgh by the Midland route are designed largely to give direct communication from Leicester, Nottingham, Derby, Sheffield, Leeds and Bradford to Scotland, on the one hand; and to provide a useful proportion of the trains from London to Leicester, Nottingham, Sheffield, Leeds and Bradford on the other. The particular route followed by each of the trains concerned is regulated accordingly. Through traffic from London to Scotland by this route may now be regarded as of secondary importance, seeing that the same railway operates considerably faster services to Edinburgh and Glasgow over the West Coast main line.

[Reply to "SAINT ANDREW."]

Some Locomotive Queries.

In the photograph of a 0-4-0 L.M.S. tank locomotive on p. 443 of the December issue, the dumb buffers shown provide ample bearing for the buffers of the adjacent wagons when shunting round curves of very short radius; they are often adopted in the case of small shunting engines. The sheet metal guards for the slide-bars and crosshead are to provide specially against heating of these parts due to dust, grit, &c., when the engine is working in sidings. In the photograph of a N.S. 0-6-0 goods engine converted from tank to tender locomotive, which appeared on p. 264 of the October issue, the small rod under the reversing rod is for the purpose of operating the sanding gear.

[Reply to K. W. S. M.]

Head Codes, G.E. Section, L.N.E.R.

Presumably, the standard head codes are used in the immediate vicinity of Cambridge in view of the fact that L.M.S.R. trains are concerned both north and south, and G.N. section trains south, so that to employ special codes would require arrangements in regard to other than Great Eastern routes. The exception in the case of the Mildenhall route is apparently justified by the fact that the divergence occurs before another station is reached, but not at Cambridge itself, as in the case of the Bury line. The latter, by the way, ranks practically as a main line. Mark's Tey trains use a special code on the branch in view of their connections at Mark's Tey and intermediately.

[Reply to A. C. H.]

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Speed Restrictions, G.W.R. Main Line.

We are indebted to Mr. John C. Romer for a fuller list of speed restrictions between Paddington and Newton Abbot than that given on p. 472 of the December issue. These are as follows :—

	Down Line. M.p.h.	Up Line. M.p.h.
Westbourne Park	—	30
Reading	40	40
Oxford Road Junction (Reading)	50	40
Southcote Junction	40	40
Westbury	30	30
110 m. 10 c.-110 m. 35 c. ..	40	45
Frome	30	30
Castle Cary	60	—
Cogload Junction	—	50
Exeter	25	35
Starcross	45	45
Dawlish	45	45
206 m. 70 c.-207 m. 20 c. ..	35	35
Teignmouth	45	45

[Further Reply to "COUNTY TANK."]

L.M.S. 4-6-4 Tank Engines, Midland Division.

These eight engines—Nos. 2100–2107, inclusive—were built for the late London, Tilbury and Southend Railway, before absorption by the Midland, for service between Fenchurch Street and Southend, but were not permitted to run into Fenchurch Street on account of bringing excessive weight on to the Great Eastern bridges east of Gas Factory Junction. Since then, these engines have been employed on various duties, and now work principally on the Midland suburban services between St. Pancras, St. Alban's and Luton.

[Reply to A. J. T.]

S.R. (S.E. & C. Section) Locomotives.

All classes of engines have, of course, been illustrated and described in the pages of the RAILWAY MAGAZINE, including those mentioned specifically by you. As a rule, however, this was at the time they came out, while only recent issues of the RAILWAY MAGAZINE are still in print. The so-called Borsig locomotives are the 771-782 series. In regard to alterations, presumably you refer to the fitting of some engines with the top-feed arrangement. The line is to be widened between Shortlands and Beckenham Junction.

[Reply to R. H. U.]

Power Signalling at the B.E.E.

The Westinghouse Brake and Saxby Signal Company exhibited both compressed air (electric control) and electric point mechanisms. Plant of one kind or the other is used practically throughout the Metropolitan, Metropolitan District, and London tube railways on the electric sections. It is also to be found at many of the big stations where power signalling has been installed, as at Newcastle Central and Glasgow Central, as well as in several other places.

[Reply to "JUMBO."]

Double-headed Trains on Water-Troughs.

We are indebted to Mr. E. L. Smith for a note to the effect that on certain railways, on occasions when both engines of a double-headed train require to take water, the rear engine takes water first, so that if the enginemen have any difficulty in drawing up their scoop, it does not prevent the front engine from taking up a supply, Further, when the scoop of the front engine is lowered, it makes it easier for the scoop of the second engine to be raised again.

[Further reply to T. G. RIMINGTON.]

The Fastest British Train.

It is now established by the G.W. authorities that the working time of the 7.10 p.m. express from Paddington to Birmingham is 51 minutes for the 52 miles 54 chains from Prince's Risborough to Leamington, start-to-start, as shown in the public time-tables. This gives an average speed of 62·0 m.p.h., and being therefore slightly faster than the booking of the 3.45 p.m. from Swindon to London, takes the premier place for speed in this country.

[Further reply to T. W. LINSELL.]

Central Wales Section, L.M.S.R.

We have no knowledge of any suggestions that this section of line should be transferred to the G.W.R., or of similar changes affecting the Hereford, Brecon and Swansea section, although, as you point out, the latter requires to be associated with the G.W.R. for through route purposes. In any case any such transfer, not being covered by the Rail-

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ways Act of 1921, would have to be the subject of Parliamentary powers.

[Reply to R. D. J.]

Metropolitan Railway Goods Traffic.

While goods traffic passing through the tunnel sections is usually worked by electric locomotives, there are occasions when steam engines work through. So far as Great Western goods trains are concerned, the point is not that they could be hauled electrically between Bishop's Road and Smithfield, but that the engines have to do shunting work also in the goods depot.

[Reply to R. NEWMAN.]

Electric Traction.

We have on several occasions explained that some lines provide for current return through the running rails and others use a separate negative conductor, in which case the positive rail is usually outside the negative rail between the running rails. There are usually good reasons for adopting one practice in preference to the other, according to circumstances.

[Reply to F. A. VERDON.]

Queen's Road Platform, L.N.E.R.

The platforms between Hackney Downs and Clapton stations, on the Great Eastern section of the L.N.E.R., were put in with the idea that a station, to be known as Queen's Road, would be provided there. The station was, however, never completed, and the line was opened without it. Queen's Road box is an important signalling point on this section.

[Reply to "SNOW HILL."]

L.N.E.R. (Great Northern) Locomotives.

The superheated Great Northern "Atlantics" have never carried a working pressure of 200 lb. per sq. in.; the figure adopted in the 1452–1461 series was 150 lb., although we believe a number of the engines now carry 180 lb. pressure. The new 0-6-0 side-tanks Nos. 3231–3240 carry side-tanks sloping downwards on top at the front end.

[Reply to A. C.]

L.N.E.R. (Great Northern) "Atlantics."

We are obliged to Mr. C. T. Hambleton-Sharp for information to the effect that the 4-cylinder compound engine No. 292 is still working, with modified Walschaert gear, as a compound, and has not been rebuilt with two simple cylinders, as stated. No. 1300 has been scrapped, although it ran for some time as a 2-cylinder simple after rebuilding.

[Further reply to A. and J. JOHNSTON.]

Arrangement of 4-track Roads, G.W.R.

From London to Didcot the four roads are arranged in pairs, the fast roads being on the south side and the relief roads on the north; the Great Northern and South Western practice of arranging the fast roads in the centre is not followed, except in certain isolated instances, where reception roads for goods traffic are arranged on both sides of the main line.

[Reply to "SNOW HILL."]

The Heaviest Coaches.

We know of no heavier coaches in this country than the 47-ton all-steel dining cars on the North British section of the L.N.E.R. If articulated sets be regarded as a "coach," however, the quintuple dining-car set employed on the Leeds service of the G.N. section of the same railway weighs 118 tons.

[Reply to A. J. T.]

Southern Railway Queries.

The gradient of the New Cross bank on the "Brighton" section is substantially 1 in 100 from New Cross to Forest Hill. The indicating letters used for Southern Railway locomotives apply to the respective locomotive depots, E being derived from Eastleigh, A from Ashford and B from Brighton.

[Reply to J. D. BINNS.]

Position of Signal Cabins.

To answer enquiries as to positions of individual signal-boxes goes rather beyond the limits of this section. We understand, however, that, of those mentioned by you, Sonning, Enborne Junction and Sampford Siding boxes are on the down side, and Tavistock Junction on the up side.

[Reply to J. G. ROMER.]

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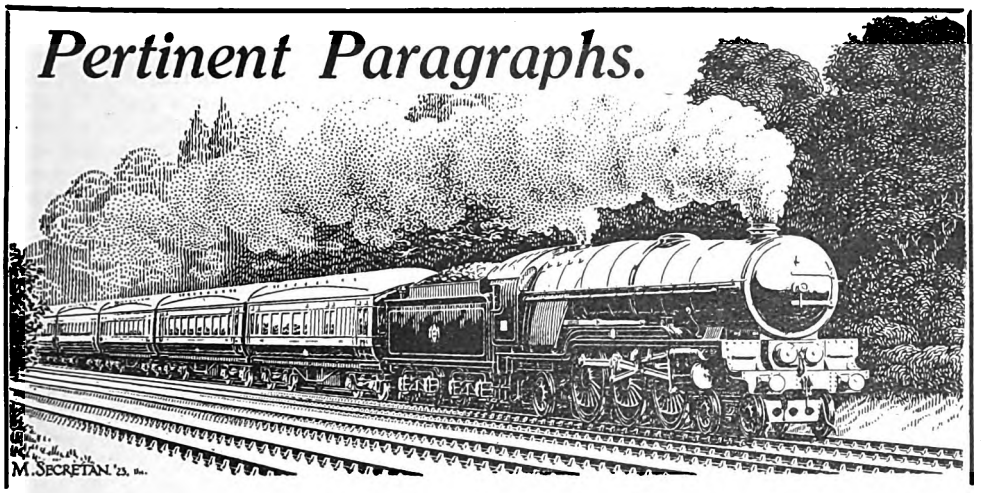
Pertinent Paragraphs.



Great Southern Railways (Ireland).

THE Railway Tribunal of the Irish Free State having sanctioned, with a few modifications, the agreed scheme between the Great Southern Railways Company of Ireland and the Dublin and South Eastern Railway Company, pronounced on January 1 that the amalgamation scheme was complete and had only to be signed and sealed.

The board of the amalgamated company now consists of 15 representatives of the four "amalgamating companies" and one director nominated by the London Midland and Scottish Railway under the powers of the Railways (Directorate) Act, which received the assent of both the Senate and the Dail before the close of last year. In the case of the directors nominated by the "amalgamating companies," there have been some changes since the names of the new board were announced in the December RAILWAY MAGAZINE. Mr. Joseph Tatlow, who was elected as a representative of the former Midland Great Western Company, has now decided to retire under medical advice, and the Earl of Kenmare, who was one of the representatives of the former Great Southern and Western Company, has also retired.

The Railway Tribunal has still to deal finally with the 22 absorbed companies. Settlements have been arrived at by the Dublin & South Eastern Company with the two separate undertakings, viz., the City of Dublin Junction Railways and the New Ross and Waterford Extension Railways, and also with the Dublin and Kingstown Railway Company.

Exceptional Run on the Great Western Railway.

WE are indebted to the Earl of Sandwich for details of the exceptionally fast run from Plymouth to London in connection with the arrival of the *Mauretania* at Plymouth on Monday, December 8. He was travelling in the train and, although he did not have a stop watch with him, made notes of the principal passing times. The engine was of the four-cylinder 4-6-0 class, *Knight of the Bath*, the load consisting of two dining cars, four passenger vehicles and a brake van, all of the usual main line type, presumably of the heavy standard pattern. In addition to the usual slacks there was one check to about 30 m.p.h. approaching Teignmouth. The times noted were as follows :—

		h. m. s.	Miles.	Mins.
Plymouth Dock (Millbay)	dep.	8 34 30		
Plymouth North Road ..	pass.	8 39 0	1 (approx.)	4½
Exeter ..	,,	9 43 0	52	64
Westbury	,,	11 1 0	78¼	78
Newbury ..	,,	11 40 0	42½	39
Reading ..	,,	11 54 0	17	14
Paddington	arr.	12 28 0	36	34
			226¾	233½

The Earl of Sandwich directs attention to the fact that the first mile necessarily occupied 4½ minutes and that the 174 miles from passing Exeter to the stop at Paddington occupied only 2 hours 45 minutes. He estimates that his times are approximate to within 15 seconds.

A Locomotive with 350 lb. Pressure.

A LOCOMOTIVE for which is claimed the ability to develop one-third more power with a correspondingly lower consumption of fuel and water has recently been placed in service on the Delaware and Hudson Railway Company. The engine is of the 2-8-0 type with two cylinders working on the compound principle, and a noteworthy feature of the construction is that the boiler carries a pressure of 350 lb. per square inch. To mark the occasion a luncheon was held, to which several hundred railway, industrial

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and public officials were invited, and the President of the company, in the course of a speech, remarked that to make this high pressure possible certain portions of the boiler, superheater, cylinders, piping and other connections had been strengthened; in fact, this locomotive is reputed to have a higher factor of safety than that ordinarily provided for. The design, it is said, is the result of twenty years of research by the railway company's engineers. The engine weighs 273 tons and has cost $105,000, the equivalent of £22,340. The firebox, instead of being constructed in the usual form of flat plates connected together by staybolts, is built up of self-supporting cylindrical structures, these being in the form of drums and tubes disposed horizontally and vertically and directly exposed to the furnace heat, thus "splitting" up the boiler water into small streams and providing for its rapid circulation. The new engine has been named *Horatio Allen*, in honour of the man who ran the first locomotive in the Western hemisphere.

New Zealand Government Railways.

THE Royal Commissioners, Sir Sam Fay and Sir Vincent Raven, presented their report and recommendations to the New Zealand Government on December 11. In many respects the recommendations are similar to those made in regard to the New South Wales Government Railways, summarised recently. Thus the financial recommendations generally correspond, while the establishment of a Railway Board is advocated. It is suggested that there should be two general superintendents, one for North Island and one for South Island, and that the number of traffic and engineering districts should be reduced. To facilitate engineering maintenance on branch lines, flying gangs are recommended. It is suggested that locomotive arrangements should be entirely reorganised, and that there should be a complete revision of the train services. Another point is that additional tourist and excursion facilities should be arranged. It is further recommended that a control organisation should be set up to regulate train movements and to cover wagon stock distribution. Revision of rates and fares is advocated, also reorganisation of the Stores Branch and the compilation of more complete statistical data. We understand that a chairman for the proposed Railway Board has already been appointed.

London & North Eastern Railway Musical Society.

IN view of the conspicuous success attending the innovation of a carol concert last year, it is not surprising that this year's concert of a similar character, given by the Society at Queen's Hall, Langham Place, on Saturday, December 20, attracted a very large audience. Carols and other Christmas music were rendered in a manner which was plainly highly appreciated by everyone present. Colonel William Johnson Galloway, Honorary Conductor to the Society, had under his baton a male voice choir of over 300, recruited from Cambridge, Grimsby, Ipswich, King's Lynn, Norwich, Peterborough, York, &c., as well as from London, together with the Society's full orchestra of about 100. The soloists were Miss Lilian Stiles-Allen and Miss Dorothy Clark, while Dr. Stanley Marchant presided at the organ, Mr. Sydney Harrington, F.R.C.O., assisting and acting as accompanist. Before the concert proper Dr. Stanley Marchant gave a short organ recital. The orchestra had three items to themselves —the very difficult "Meistersingers" Overture, the "Reine de Saba" March (Gounod), and Handel's "Largo in G." They had, however, plenty to do throughout the programme in accompanying the choir and the soloists. A special feature was the selection of carols and Christmas music, including several of a popular character, in which the audience were at times invited to join, and some of the best examples of such music, ancient and modern, which could have been selected. Principal interest attached, however, to a cantata for soprano solo (Miss Lilian Stiles-Allen), male voice choir and orchestra, composed for, and dedicated to, the London and North Eastern Railway Musical Society by Dr. Stanley Marchant, and of which this was the first performance. This work was conducted by Colonel Galloway at the express wish of the composer, who officiated himself at the organ, and at its conclusion received quite an ovation. Dr. Marchant was also responsible for a part-song, "Ode by a Christmas Pudding at Sea," which, although not new to the Society's concerts (it was originally composed for the Society), was highly appreciated, introducing incidentally a touch of humour. But while appreciation was freely indicated of the splendid services rendered by those directly under notice, the main honours must be shared with the choir and orchestra, who in every respect fully maintained the reputation the Society has achieved for well-selected music of a high-class character, rendered in a style which is almost, if not quite, inimitable by any other similar body.

The audience included a large number of railway directors and chief officers. Thus, the London and North-Eastern Railway Company was represented by—

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Mr. William Whitelaw, Chairman; Lord Faringdon, C.H., Deputy-Chairman; Messrs. H. T. Bailey, W. B. Gair, and, of course, Colonel William Johnson Galloway, Directors. Sir Ernest Palmer, Bart., Deputy-Chairman of the Great Western Railway Company, was also present.

Chief officers of the London and North Eastern Railway included the following :—

Sir Ralph L. Wedgwood, C.B., C.M.G., Chief General Manager; Mr. J. A. Campbell, Registrar; Mr. Alex. Wilson, Divisional General Manager; Mr. E. A. Clear, Assistant General Manager; Mr. C. L. Edwards, Chief Accountant; Mr. A. L. Gibson, Continental Traffic Manager, South; Mr. J. Miller, Chief Civil Engineer (G.E. Section); Mr. E. L. Hawkins, Assistant Civil Engineer (G.E. Section); Messrs. James McLaren and G. F. Thurston, Joint Secretaries; Dr. Grant MacMahon, Medical Officer; Mr. G. Marshall, Goods Manager, Southern Area; Mr. C. J. Selway, Passenger Manager, Southern Area; and Mr. L. Sydney Smith, Hotels Manager, Southern Area.

Arrangements generally were in the hands of the Concert Committee, of which Mr. Percy Syder was chairman, and particularly of Mr. A. W. Headley, as Hon. General Secretary, together with the Divisional Committees and the Hon. Divisional Secretaries, and the Choral and Orchestral Librarians. Captain E. F. Warren served as Chief Seating Steward, while Mr. A. E. Lambert was Hon. Ticket Secretary for the concert.

L.M.S. to spend £14,000,000.

New employment on a scale sufficiently extensive and widespread to affect the labour problem throughout Great Britain will be created by an elaborate programme of work upon which the L.M.S.R. have now decided to embark. This work, which is mainly in the nature of renewals, extensions and maintenance, will involve an expenditure of nearly £14,000,000. Part of the work will be done in the railway's own workshops, the remainder by outside manufacturing concerns in Great Britain.

The scheme provides for new locomotives; new sleeping cars; vestibule and corridor stock, of which some will go to the make-up of entirely new trains for service on various routes; new kitchen and dining coaches of types to embody the latest ideas of railway culinary equipment, and new rolling-stock for coal and live-stock traffic, including special wagons for the better transport of motor vehicles, the quicker unloading of minerals and grain, and the better protection and preservation of foodstuffs.

Further expenditure covers such matters as relaying of permanent way, strengthening of bridges, and upkeep of stations. Details of the scheme are as follows :—

Locomotives.

Provision has been made for the building of some 235 new locomotives. This includes 220 large passenger and freight engines, and 15 smaller passenger locomotives which are already "ear-marked" for special routes such as the Cathcart (Glasgow) and Tilbury services.

Coaching Vehicles.

An expenditure of nearly £5,000,000 on new coaching vehicles provides for the building of 2,591 coaches for use on passenger trains, the majority being of the vestibule and corridor type.

Kitchen Cars.

One of the most striking innovations in the new stock is to be found in the kitchen cars. These are so designed as to be able to serve 250 meals at one sitting, a capacity four times that of an ordinary dining-car kitchen. Forty such cars are to be made. They will be of steel construction throughout, with the exception of a certain amount of karri—an Australian hardwood which is virtually non-inflammable.

Wagons for Grain, Cattle and Motors.

The most costly item in the scheme is the amount allocated for the construction of wagons, and, with a view to obviating any possible shortage in the future, it has been decided to build no fewer than 30,000 of these vehicles. A large number of them are mineral trucks, principally for the conveyance of coal. Included in the programme also are a number of refrigerator cars and special vehicles for the transport of light motor cars. In order to reduce time in handling bulk grain, hopper vehicles have been specially designed for this particular class of traffic.

As an effort to deal with the shortage of cattle trucks, due principally to restrictions introduced to combat outbreaks of foot-and-mouth disease, the company propose to put in hand immediately for this class of traffic a number of wagons which are to be constructed on new hygienic principles, their chief feature being the ease with which they can be cleaned and sterilised.

Relaying and Renewals.

For relaying permanent way an appropriation is made for buying very large quantities of steel rails, sleepers and crossing timbers, and a considerable sum is to be expended in the strengthening of bridges and the painting and cleansing of stations, &c.

New Works.

One of the principal items under "New Works" is the proposed improvements at Holyhead. The increased lairage to be provided will enable considerably larger shipments of live-stock to be effected from

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the Irish ports. In anticipation of the time when the L.M.S. mail steamers will be able to arrive at the Inner Harbour instead of at the Admiralty Pier, as at present, Holyhead station is also to be greatly improved. Other stations set down for reconstruction are those at Bramhall (Cheshire), Birkdale (Lancs.), Blidworth (Notts.) and St. Pancras sub-station. Provision is now made for a new steamer which is intended for the Clyde passenger service.

Metropolitan Junction Accident, Southern Railway.

LIEUT.-COLONEL A. H. L. MOUNT'S report to the Ministry of Transport in regard to the collision which occurred at 3.21 p.m. on September 13 at Metropolitan Junction, between Charing Cross and London Bridge, Southern Railway, has been issued. The 3.15 p.m. empty coach train, Charing Cross to Addiscombe Road, was passing through Metropolitan Junction on the down main line towards London Bridge, under clear signals, when a light engine, running tender first upon the up east chord line, bound from Cannon Street for Charing Cross, passed the Junction up home signal at danger, and came into side-long collision with the last two vehicles of the train. The rearmost vehicle was thrown foul of the up main line from London Bridge, with the result that almost immediately afterwards it was struck by the engine of the 1.0 p.m. passenger train, Dover Marine to Charing Cross, which was approaching at the time.

Guard Godfrey, of the empty train, sustained a severe scalp wound and fracture of the right arm, necessitating amputation. It was thought that his injuries were the result of the first collision, and that the second caused the debris of the coach to fall upon him. Inspector Dickson and Foreman Palmer were able to render first-aid, and to extricate him within 25 minutes of the collision, when he was promptly taken to hospital, where progress towards recovery has been satisfactory. The two coaches were damaged beyond repair, and the light engine tender and passenger train engine bogie wheels were derailed. The empty coach train consisted of 14 six-wheeled vehicles, weighing 186 tons, and was drawn by engine No. 361, tank type 0-4-4. The light engine was No. 253, 0-6-0 type tender. The passenger train was drawn by engine No. 781, 4-4-0 type, and comprised one 4-wheeled coach and seven 8-wheeled bogie coaches.

Misreading Signals.

THE circumstances of this accident were quite simple, though, having regard to the place where it occurred, the consequences might have been more serious, particularly if the train concerned had been carrying passengers. Driver Leggett of the light engine and his Fireman Howick, were primarily in fault, the former misreading or misunderstanding the signals and being guilty of keeping a somewhat inadequate look-out, while a share of the responsibility is attributed to the fireman.

The inspector analyses the situation in regard to observation and clearness of signals, but does not adopt the view suggested by the enginemen in fault that any particular difficulty was involved. In extenuation, the driver was apparently worried to some extent about the oil supply for his engine, which he was to receive at Charing Cross. In concluding the report, however, Colonel Mount refers to the driver's excellent record, and that his remarks as to signalling, &c., were rather in the nature of explanation or extenuation than of excuse. "There is no doubt that this was not a case of mistaken identity of the signals concerned, owing, for instance, to bad sighting or to momentary and partial obscuration, but one of definite misreading followed by lack of observation. The consequences must, therefore, be attributed to negligence under conditions of traffic where the greatest care is imperative. . . . So far as the working is concerned, from the evidence given by the signalmen and from discussion with the Company's officers, I am satisfied that although the movements daily upon the up east line are comparatively few, traffic conditions upon the main line require the special acceptance now authorised. And, provided that the speed restriction of 20 miles an hour is adhered to, I see no reason to make any recommendation with a view to alteration of the present method of working."

Buffer-Stop Collision at London Road, Manchester.

MAJOR HALL'S report to the Ministry of Transport on the accident which occurred on September 19 at 7.37 a.m., at London Road Station, L.M.S. portion, has been issued. As the 7 a.m. passenger train from Alderley Edge to Manchester was entering No. 4 platform, it came into collision with the buffer-stops, damaging certain of the station buildings, including public conveniences, lavatories and station master's office. As a result of the collision, Davies, a clock-room attendant, who was at the time in the buildings in question, was injured, and three passengers in the train complained of shock.

The buffer-stops, which are of the hydraulic type, were demolished, and considerable damage was done to the station buildings immediately behind them, the engine

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mounting the end of the platform, and after demolishing first an external, and subsequently an internal, brick wall, came to a stand with the rear end of the footplate a few feet outside the platform wall. No damage was done to the stock, nor was there any derailment, except that due to the lifting of the engine. The engine was not withdrawn from service for repairs.

The train consisted of eleven eight-wheeled bogie coaches, having a total weight of 282 tons. It was fitted with the vacuum automatic brake operating blocks upon all wheels of the stock. The engine was of the 4-6-0 "Experiment" class with six-wheeled tender, weighing in working order 102 tons 15 cwts., and having a total length of 57 ft. 9 ins. over buffers, including the tender; the total length of the train and engine being about 659 ft.

Value of Substantial Buffer-Stops.

As pointed out by the inspector, there does not appear in this case to have been anything abnormal either in respect of train equipment or extraneous conditions generally which might have embarrassed the driver in the process of bringing his train to a stand at the correct place. The accident, therefore, must be attributed to some degree of misjudgment on his part, the extent of which turns mainly upon the handling of the train into the platform and the speed at which the impact with the buffer-stops occurred. At first sight, the extent of the damage and the distance which the engine travelled after demolishing the stops and mounting the end of the platform would suggest that the impact took place at some considerable speed, approximating, in fact, to the estimate made by foreman Walling. Two points, however, must be borne in mind in this connection; first, the fact that the buffer-stop unit was in some respects of comparatively unsubstantial construction, and therefore readily separated into its component parts; and secondly, that the effect upon the train was practically *nil*, the whole of its energy of motion, therefore, being absorbed in structural damage.

There was, of course, a degree of conflicting evidence, but the inspector adopts the view that Driver Rogerson's action amounted rather to mismanagement than a minor error of judgment. He is, however, a man of long service with a first rate record, and had 25 years' experience as a driver. With regard to the buffer-stops, they are of smaller type than the long stroke and heavier hydraulic stops used at many other terminal stations. Hence the structure generally was disintegrated, but without much damage to the component parts. It is suggested that the company would be well advised to adopt a more substantial type in future.

Notes on French Railways.

We are indebted to Mons. A. Alliaume for some notes concerning express train running on the Northern Railway of France during the past summer. He points out that the speed of trains on the Paris-Calais section is now about the same as in pre-war times. The fact that speed has been slower until now is explained largely by the fact that so much of the permanent way has had to be entirely relaid. Mons. Alliaume supplies the table above.

Non-stop Runs.	Distance.		Time.	Speed.		Number of Runs.
	Km.	Miles.		Km.	Miles.	
Paris-Boulogne	254	158	165 min.	92·4	57·4	2
Paris-Etaples	227	141	141 ,,	96·6	60·0	2
Paris-Calais Ville	295	184	190 ,,	93·2	57·9	4
Paris-Arras	193	120	128 ,,	90·5	56·2	7
Paris-Aulnoye	216	134	140 ,,	92·6	57·5	3
Paris-St. Quentin	154	97	100 ,,	92·4	57·4	5
Paris-Bruxelles	311	194	225 ,,	83·0	51·6	2

Commenting on these figures, Mons. Alliaume points out that he has made the Paris-Etaples (serving the well-known resort of Paris-Plage) run in two instances by the 4 p.m. express in 139 and 140 min., well over 60 m.p.h. average. Concerning the Paris-Brussels run, the longest non-stop run without taking water *en route*, the speed on the Belgian section is restricted to 45 m.p.h., owing to the condition of the permanent way. All the expresses mentioned in the table are worked by *Pacific* locomotives, except occasionally between Paris and Arras, when *Atlantics* are sometimes to be seen. The run in 139 minutes noted above was made on August 29 under adverse

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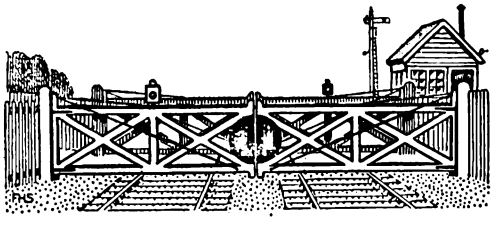
atmospheric conditions, with a train comprising two cars of the "Orient-Express," two cars of the "Rome-Express," a through car "Biarritz-Boulogne," and the ordinary boat train, making in all well over 400 tons.

In reference to remarks in the August number concerning the *Baltic* locomotives on the Northern Railway of France, Mons. Alliaume mentions that one of these has been fitted to burn "mazout," and has occasionally made a run, though, presumably, the results of this trial have not been particularly satisfactory, in view of the high price of the oil. He states that although he travels frequently on the Northern Railway, he has never seen one of these engines.

The Ceinture Railways of Paris.

We are indebted to Mr. C. B. Farrar, of Fourqueux, Seine et Oise, France, for the following remarks as to traffic on the Ceinture Railways of Paris, which may be regarded as supplementary to the article published in the November number:—"Traffic on the western portion of the Grande Ceinture is fairly heavy, especially in goods trains from Boligny and Le Bourget Tivage, towards Versailles and Luvisy. The passenger service is fairly liberal too. The goods trains are always hauled by the 0-6-2-2-6-0 tank engines, and present a fine spectacle struggling with their heavy loads up the gradient from Achères to St. Nom La Bretèche. The passenger service is almost entirely in the hands of the 4-6-4 tank engines, all the locomotive stock being of the Nord pattern. As is now generally the case in the Paris area, the fine locomotives are in strange contrast to the antiquated carriages for the suburban services. All the rolling-stock on the Ceinture is four-wheeled, and the running appalling. I think I dare say that no steam-hauled Parisian suburban train ever has bogie stock—practically all the carriages are four-wheeled—while the Etat, and particularly the Est, still revel in the 'Impérial,' a double-decked carriage, some of those on the Etat being open. Personally, I shall be very sad the day the 'Impérial' disappears; if one defies soot and grimy seats, there is nothing more enjoyable than a journey 'on top' from St. Lazare to St. Nom La Bretèche on the Etat. Electric trains are now running from St. Lazare to Becon les Brugeres and Colombes, and, needless to say, easily overtake the 'Banlieu,' with its 20 odd carriages jolting and swaying along at a reckless 30. After years and years of being about to do so, the Etat have now almost completed the pulling down of the Batignolles tunnel of ill fame. The line to St. Germain is also about to be electrified. The platforms are being raised to the carriage level, and doubtless the terrific incline from Le Pecq to St. Germain will cease to have its terrors. I have personally been on an 'Impérial' of a train that 'stuck' in the tunnel beneath the Terasse de St. Germain, and the train and banking engines in their efforts to grip the greasy rails threatened us with suffocation. I must confess I regret the modernisation of French railways. The old brass-boilered engines of the Paris-Orleans and the antiquated collection of the Etat have fled the capital. The enormous influx of American 2-8-0 goods engines and the various German engines (some hideous beyond all words) have driven much of the French locomotive stock to the scrap heap. The Etat becomes monotonous with 'Pacifics' of a type which threatens to impose itself on other companies, the Est and Orleans having several, and the Nord one, I think."



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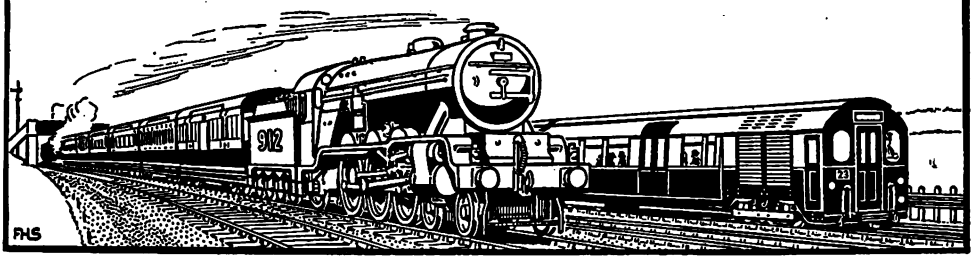
WHAT THE RAILWAYS ARE DOING.



Colonel Sir J. W. Pringle, C.B., R.E., who has received the honour of knighthood, has held the position of Chief Inspecting Officer of the Railway Department, first of the Board of Trade, and more recently of the Ministry of Transport, since August, 1916. He received his commission as Lieutenant in the Royal Engineers in February, 1883, and two years later was engaged in the Burmese War. In 1890 he was on the Zhob Valley Railway survey, and went thence (1891–1893) as second in command, and, later, was placed in charge of the Uganda Railway survey. From 1896 to 1898 he was Superintending Engineer on the survey and construction of the Hyderabad-Godavery Valley Railway, after which he went to the War Office. In June, 1900, Major Pringle, as he then was, went to the Board of Trade as an Inspecting Officer of Railways, and was made Chief Inspecting Officer on August 1, 1916. In 1903 he inspected the Uganda Railway on its completion. On August 4, 1914, he was mobilised as Deputy Director of Railway Transport, Home Defence, with the temporary rank of Colonel, and served there until he returned to the Board of Trade to succeed Colonel von Donop as Chief Inspecting Officer.

Photo.] [*Histed & Co.*

COLONEL SIR J. W. PRINGLE,

Chief Inspecting Officer for Railways, Ministry of Transport.

* * *

Mr. Robert Gilmour, Station Master at St. Enoch station, Glasgow, has retired after 48 years' service with the Glasgow and South Western Railway Company (now the London Midland and Scottish Railway). During the past 22 years Mr. Gilmour acted as Station Master at St. Enoch station. (See article in the January number.) Mr. Robert Murray has been appointed Station Master at St. Enoch, Glasgow, L.M.S., in succession to Mr. Gilmour. Mr. Murray was Chief General Inspector on the Glasgow and South Western section of the L.M.S.R. He is a native of Kirkcudbright, and started his railway career at Prince's Pier, Greenock.

* * *

Mr. William McConchie, who has had charge of the Portpatrick and Wigtownshire section of the L.M.S.R. since grouping, but who was formerly Secretary and Traffic Manager of the Portpatrick and Wigtownshire Joint Committee and the Larne and Stranraer Steamship Joint Committee, has retired, after completing 48 years' service. Mr. McConchie joined the Portpatrick Railway in 1877 as a telegraphist, and became a station master in 1882. In 1888 he was appointed Traffic Inspector for the Portpatrick and Wigtownshire Joint Railways, and in 1905 he transferred to Belfast as Traffic Manager for the Larne and Stranraer Steamship Joint Committee. In 1914 the care of both the railways and the steamers was given him.

* * *

We regret to record the death on January 2, at a nursing home, in his 70th year, of Mr. Charles A. de Pury, Chief

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MR. H. S, STEWART,

Appointed Secretary,
Metropolitan Railway Company.

Accountant of the Southern Railway Company.

* * *

MR. HERBERT SOMERVILLE STEWART, who has been appointed Secretary to the Metropolitan Railway Company in succession to Mr. W. H. Brown, was born in July, 1868, educated at Bishop Stortford College and at London University College School, and received a technical education at King's College, London, and the London School of Economics. He entered the service of the Metropolitan Railway in the Audit Office in October, 1885, afterwards obtaining experience in the Accountant's Department and in the General Manager's Office. In October, 1903, he was appointed Chief Clerk in the Accountant's Department, and in January, 1911, became Chief Clerk to the General Manager. He was appointed Assistant to the General Manager in October, 1913. Mr. Stewart has for some time held the office of Secretary to the East London Joint Committee. He will retain his position as Assistant to the General Manager in combination with his new duties as Secretary to the Metropolitan Railway Company.

* * *

MR. WILLIAM MARRIOTT, Engineer and Traffic Manager of the Midland and Great Northern Railways Joint Line, retired on December 31. The dual position of Engineer and Traffic Manager has been abolished, and the following appointments operate as from January 1, 1925 :—

Mr. R. B. Walker, A.M.Inst.T., to be Traffic Manager, King's Lynn.

Mr. W. E. Newman, M.I.Mech.E., to be Resident Mechanical Engineer, Melton Constable.

Mr. A. E. Langley, A.M.Inst.C.E., to be Resident Civil Engineer, Melton Constable.

* * *

THE following notice appeared in the *London Gazette* recently :—

CORPS OF ROYAL ENGINEERS.

Engineer and Railway Staff Corps.—Lieut.-Colonel Sir Herbert A. Walker, K.C.B., to be Colonel, and to command the unit, December 13, 1924.

* * *

MR. R. B. WALKER, who has been appointed Traffic Manager to the Midland and Great Northern Railways Joint Committee, in succession to Mr. W. Marriott, Engineer and Traffic Manager since January 1, 1919, has been connected with the Midland and Great Northern Joint Line throughout his career. He started as a junior clerk in the General Manager's office of the then Eastern and Midlands Railway, which subsequently changed into and forms the major portion of the Joint Line. After serving in various

MR. R. B. WALKER,

Appointed Traffic Manager,
Midland & Great Northern Railways
Joint Committee.

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positions in the Traffic Manager's office, including that of Personal Clerk to three Traffic Managers, he was given the position of Principal Traffic Assistant to Mr. W. Marriott in 1919. Mr. Walker served for a period in France during the war. He is an Associate Member of the Institute of Transport.

* * *

In the constitution of the London and Home Counties Traffic Advisory Committee, the following members appointed by the Minister of Transport may be noted :—

Sir Herbert A. Walker, K.C.B., General Manager, Southern Railway.

Mr. Frank Pick, Assistant Managing Director, "Underground" Railways and London General Omnibus Company.

Sir Henry Maybury, K.C.M.G., C.B., Director-General of Roads, Ministry of Transport, has been elected Chairman.

* * *

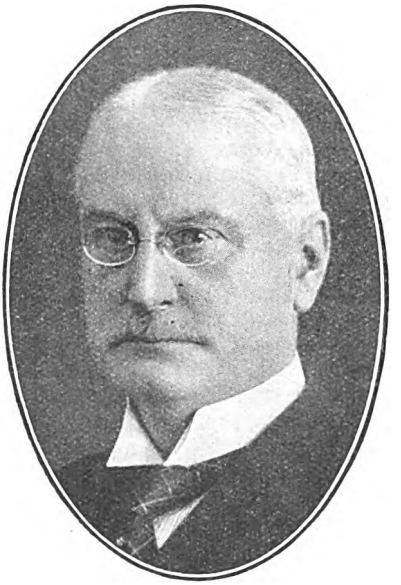
The Minister of Transport (Lieut.-Colonel Wilfrid Ashley, M.P.) has appointed Captain A. S. C. Reid, D.F.C., M.P., to be his Parliamentary Private Secretary (unpaid).

* * *

Mr. P. J. Floyd, who has been appointed Operating Superintendent, Great Southern Railway of Ireland, entered the service of the Great Southern and Western Railway in May, 1891. After general experience of outside and station duties, he was transferred to the office of the Superintendent of the Line in January, 1898. In January, 1902, he was appointed Chief of the Trains Department—an important section of the office of the Superintendent of the Line. In May, 1906, he was appointed Superintendent in charge of the Northern District, and when the position of Superintendent of the Line became vacant in November, 1919, he returned to headquarters in that capacity. His present appointment dates from November, 1924.

Photo.] MR. P. J. FLOYD, [*Lafayette.*

Appointed Operating Superintendent, Great Southern Railway, Ireland.



MR. T. ELLIOTT,

Appointed Commercial Manager, Great Southern Railway, Ireland.

* * *

Mr. Thomas Elliott, who has been appointed Commercial Manager, Great Southern Railway, Ireland, entered the service of the Midland Great Western Railway Company in 1889. In 1890 he was transferred to the Manager's Department of that line, and in 1895 was placed in charge of the Trains and Rolling-stock Departments and outdoor arrangements generally. On the reorganisation of staff under Mr. Tatlow's management, Mr. Elliott was appointed Superintendent of the Line on March 1, 1905, and in connection with further reorganisation under the management of Mr. Keogh, became Traffic Manager on January 1, 1914. Mr. Elliott's present appointment, consequent upon the amalgamation of railways in the Irish Free State to form the new Great Southern Railway, dates from August, 1924.

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Mr. E. J. H. Lemon, who has been appointed Divisional Carriage and Wagon Superintendent at Newton Heath and Earlstown, L.M.S.R., has hitherto held the position of Divisional Carriage and Wagon Superintendent at Derby, following a service of six years as Works Manager at the latter place. Mr. Lemon received his theoretical training at the Heriot Watt College, Edinburgh, and the first part of his practical training at the Hyde Park Works of the North British Locomotive Company, where he gained experience in all departments. He was afterwards, for a short period, with Brown Brothers, hydraulic engineers, Edinburgh, and subsequently had a year's running shed experience with the Highland Railway at Inverness prior to joining the staff of Hurst, Nelson & Co. Ltd. In 1911 Mr. Lemon entered the service of the Midland Railway as Chief Wagon Inspector and was promoted Works Manager in 1917. He was awarded the O.B.E. at the end of the war in recognition of Government work done in the Carriage and Wagon Department of the Midland Company at Derby.

MR. E. J. H. LEMON,

Appointed Divisional Carriage and Wagon Superintendent, Newton Heath and Earlestown, London Midland & Scottish Railway.

* * *

The Board of Management of the Railway Benevolent Institution has appointed Mr. E. A. Lane, F.C.I.S., to the position of General Secretary, in succession to Mr. A. E. Mills, M.A., M.I.E.E., who retired at the end of last year. Mr. Lane entered the service of the Institution in September, 1880, at the age of 15 years, as junior clerk, became Secretary's Chief Assistant in November, 1900, and was appointed Assistant Secretary in July, 1906.

* * *

Mr. J. A. Hookham, M.I.Mech.E., retired on December 31 from the position of Mechanical Engineer, Stoke-on-Trent, L.M.S.R.

* * *

We regret to record the death of Monsieur Jules Henri Jean Florentin Verdeyen, a chief officer of the Belgian State Railways, but best known in other countries as General Secretary of the International Railway Congress Association, in which position he succeeded the late Monsieur Louis Weissenbruch on the death of the latter in August, 1921. Monsieur Verdeyen was also President of the Belgian Union of Railway Engineers.

MR. E. A. LANE,

Appointed General Secretary, Railway Benevolent Institution.

* * *

Mr. Herbert Sinclair, District Locomotive Superintendent at Peterborough, L.N.E.R., died suddenly from heart failure while at Bournemouth last December.

* * *

Restaurant cars are being run on the 8.30 a.m. and 1.50 p.m. L.N.E.R. through expresses from Liverpool (Central) to Manchester, Sheffield (Victoria) and Hull (Para-

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gon), and on the 2.50 p.m. and 6.33 p.m. through expresses from Hull (Paragon) to Sheffield (Victoria), Manchester and Liverpool (Central).

* * *

MR. F. G. RANDALL, who has been appointed District Superintendent, Southern District, Great Eastern Section, London and North Eastern Railway, became Assistant Divisional Superintendent in charge of the London Division in August, 1923. Mr. Randall commenced his career in the Divisional Superintendent's office of the Great Eastern Railway at Ipswich. He remained there 14 years, the last eight as Chief Clerk. In 1901 Mr. Randall was appointed Station Master at Haughley Junction, and subsequently held a similar post at Aylsham, Wymondham, Ely and Cambridge, being promoted from Cambridge in 1916 to the position of Assistant Divisional Superintendent at Norwich. From 1921-23 Mr. Randall was Assistant to the Superintendent of Operation (Goods Train Working Section) at Liverpool Street station.

* * *

FURTHER staff changes were recently announced by the London Midland and Scottish Railway :—

Mr. C. K. Carmichael, Goods Agent, Preston, to take up a similar position at Albion.

Mr. J. H. Lees, Goods Agent, Stockport (Heaton Norris), to be Goods Agent at Stockport (Heaton Norris, Cheadle Heath and Wellington Road).

* * *

MR. E. A. DIGHTON, of the Irish Rates Section, Euston, L.M.S.R., has been appointed Chairman of the Irish and English Goods Traffic Conference for the year 1925, succeeding in that capacity Mr. R. Rowbottom, L.N.E.R.

* * *

WE are officially informed by the L.N.E.R. that upon the transfer of Mr. S. T. Burgoyne to take up the position of Assistant Goods Manager, North Eastern Area, at York, Mr. J. A. Wickham, Assistant to the Chief General Manager, King's Cross, has been appointed Industrial Agent and assumes the responsibility for the work of that position, in addition to his present duties. Mr. J. C. L. Train, of the Engineering Department, Southern Area, has been appointed to carry out the work of the Industrial Agency under Mr. Wickham, and he will work with the other departments of the railway as the representative of the Industrial Agent.

WE regret to record the death in December, at the age of 76, of Mr. Charles Kislingbury, who retired from the position of Divisional Superintendent at Bristol, G.W.R., in 1914, after holding that office since 1892.

* * *

THE London offices of the Canadian National Railways announce that the jurisdiction of Mr. Geo. E. Cowie, General Freight Agent (United Kingdom traffic), is extended to cover the Continent of Europe, including freight traffic matters appertaining to the Canadian Government Merchant Marine Limited, with the title of General Freight Agent.

* * *

THE Canadian Pacific Railway announce that M. van Heeckeren has been appointed Agent in Rotterdam of the Department of Colonisation and Development.

* * *

AT the Station Hotel, Perth, on December 12, Mr. R. W. Gairns, District Engineer, Perth, London Midland and Scottish Railway, presided at a social gathering of railwaymen, when a most enjoyable programme of song and music was contributed. The toast of "Our Railways" was submitted by Mr. Bailie Hunter, and responded to by Mr. Barrie, District Traffic Superintendent. Incidentally, Mr. Barrie seconded Mr. Gairns' observations with regard to the pleasure and profit of such gatherings as that. They were all dependent upon one another, and it was by the closest co-operation that they could help to make their machine run smoothly.

* * *

IT was a happy thought on the part of the London Midland and Scottish Railway Company to reproduce in miniature, in their 4-page artistic wall calendar, some of the famous posters specially drawn for them by various well-known painters. Each of the four pages contains a calendar for three months, surmounted by a really beautiful reproduction, in colours, of one of the aforesaid posters. Thus, for the first quarter of the year, we have Mr. Maurice Griffenhagen's striking picture of "Carlisle"; for the second quarter, Mr. Richard Jack's wonderful conception of "Steel"; for the third quarter, Sir David Murray's graceful picture of "Conway Castle"; whilst for the last quarter, Mr. Norman Wilkinson's vivid representation of Grangemouth Docks is selected.

* * *

A VERY striking portrait in colour of Isambard Kingdom Brunel, first engineer

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of the Great Western Railway (1833-58), is the feature of the wall calendar issued by the Great Western Railway Company. The picture, which shows Brunel sitting at his desk but with his face turned full to the onlooker, is mounted on a brown and green background, and beneath it is a neatly-printed tear-off weekly calendar.

* * *

In the Board Room of the L. & N.E. Railway at King's Cross, on December 22, Mr. J. Akerman, on behalf of Mr. Harold Vernon, Chairman of District 14 of the International Convention (who was unable to be present owing to the death of his father), handed to Mr. W. M. Teasdale, Advertising Manager of the L. & N.E. Railway, an illuminated address which had been prepared for his company on behalf of the American and Overseas Delegates who travelled to Edinburgh on July 1. Mr. Akerman, making the presentation, referred to the great help that the L. & N.E. Railway had given to the Convention, and to the special service rendered by Mr. Teasdale personally.

* * *

The following official statement was issued from Electric Railway House on December 29 :—

On and from January 1, the minimum fare on the "Underground" group of railways will be reduced from 1½d. to 1d. The powers of charge conferred upon the companies by the London Electric Railways Fares Act, 1920, so far as they authorised ordinary fares in excess of the company's pre-war powers, expire early in 1925. Under that Act the Metropolitan District Railway were authorised to charge 1½d. as a minimum fare. With the lapsing of these special powers that company must revert to the pre-war minimum fare of 1d. To secure uniformity, the minimum fare of 1d. will also be applied to the tube railways, viz., Bakerloo Line, Piccadilly Line, Hampstead Line, and City Railway, and Central London Railway.

* * *

The London Midland and Scottish Railway Company followed the custom, which has been adopted during the past three years, by making special arrangements to meet the needs of Coventry manufacturers in respect to the prompt transportation by rail of cars from that town to the Scottish Motor Show held at Glasgow from November 21 to 29. Five special trains, conveying 144 cars, were run in an average of about 15 hours from Coventry to Glasgow, being delivered in Glasgow early in the morning following the night of despatch. The vans of the special trains prominently displayed large-type posters showing the nature of the load. The fact that the distance from Coventry to Glasgow is over 300 miles, and that the London Midland and Scottish Railway worked these trains through so quickly, has given great satisfaction to the trade. This is the largest number of cars sent to the Glasgow Show by Coventry manufacturers in the history of the trade.

* * *

The railway companies have extended the existing arrangement in regard to week-end tickets issued on Fridays and Saturdays so as to admit of these reduced fare tickets being issued on Fridays at or after 12 noon and before 5 p.m., subject to a minimum fare of 15s. third-class. First-class (and second-class where in operation) bookings are now given between the same points as third-class bookings. This extended arrangement was brought into operation on and from Friday, January 2, 1925. The practice, which was already in existence in regard to the issue of week-end tickets after 5 p.m. on Fridays and on Saturdays, is continued.

* * *

The London and North Eastern Railway has decided to put in hand considerable improvements relating to the departure platforms at King's Cross station. The scheme includes underground bathrooms, lavatories, hair-dressing saloons, and a new inquiry office for passengers. The work is to commence immediately and will involve a cost of about £10,000.

* * *

"The Midnight Express" is a sensational film just introduced to British audiences by Pathé Freres. It is concerned with the adventures of the son of an American railroad president. The inevitable "crook" is well to the fore. The many railroad scenes will appeal to those conversant with American railroad operation. The fatality to a shunter brings home the need of "safety first." The hero "makes good" in the *finale*—an exciting breakaway of oil trucks, which rush down the single line incline that the "Midnight Express," with the president and the son's *fiancée* aboard, is ascending. The son is able at the psychological moment to derail the trucks, which fall into the canyon as the "Midnight Express" reaches the spot.

* * *

Under the chairmanship of Mr. C. J. Allen, on December 12, at the Railway Club, Mr. V. S. Haram read a paper entitled "Recent London Suburban Developments." The lecturer covered a period of from 1905

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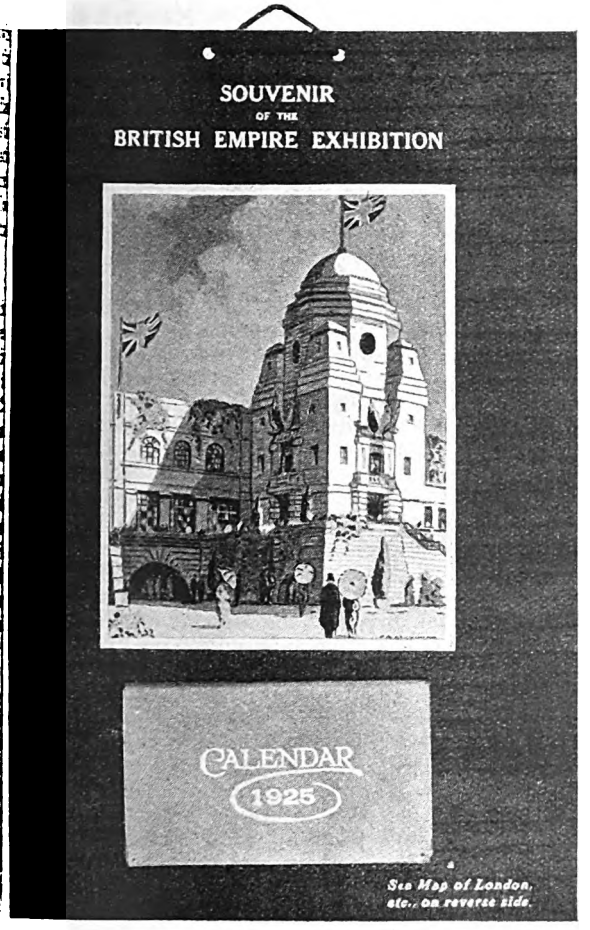

METROPOLITAN RAILWAY'S CALENDAR FOR 1925.

onwards and described in detail the numerous changes which had taken place in that period. Interesting reference was made to the efforts of steam locomotion to solve intensive suburban traffic, and to the completed electrifications. The paper concluded with considerable applause from the audience.

* * *

WITH reference to remarks published on page 500 of the December number, the "Devonport Reader" mentioned points out that some of his remarks quoted were apparently misunderstood, as he meant to convey that G.W. 0-4-2 and 2-4-0 tank engines are not used in the Plymouth district. With regard to the comment as to the use of a G.W. 4-6-0 working motor trains at Millbay station, Plymouth, he points out that it is more probable that the main line locomotive was simply shunting the vehicles. He has, however, seen main line locomotives working motor trains, though apparently to meet emergency requirements.

* * *

FOR the New Year the Metropolitan Railway Company produced an attractive calendar that is bound to make a widespread appeal. As will be seen by the miniature reproduction herewith, the subject chosen is a view of the British Empire Exhibition, which was used as the front cover of the booklet issued by the Company during the Wembley season. The calendar is finely printed in a number of colours on stout card, embellished in gold with the happiest possible effect, and displays on its reverse side a map of London that should prove invaluable to all. In addition to its artistic excellence and neatness, the value of the calendar is enhanced by total freedom from advertising matter, while a tear-off tablet for each month completes its usefulness. Copies of the calendar may be readily obtained, free, by applying to the Company's Commercial Manager, Baker Street Station, N.W., enclosing 3d. stamp to cover postage, &c.

* * *

A NOVEL form of illuminated advertisement which is attracting considerable attention has been erected at Paddington station. It is designed for the double purpose of brightening up the station and advertising seaside resorts served by the Great Western Railway. Situated on the approach from Praed Street, Metropolitan Railway, on a site known to Paddington railwaymen as "the Lawn," is a series of maps showing all the coast resorts from North Wales to Weymouth, on the "ocean coast," together with large pictures brightly illuminated.

* * *

THE L.M.S.R. is to build at Camden Town a hostel containing 90 bedrooms for the accommodation of engine-drivers, firemen and guards when staying in London overnight. Reading, dining and recreation rooms will be provided. There will be central heating throughout, and one apartment specially reserved as a drying room for the men's clothes in bad weather. Hot baths and a laundry will be available for the use of the men.

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THE lease for the placing of commercial advertisements on the Great Eastern section of the London & North Eastern Railway having expired, the L.N.E.R. Company has taken over direct control, as in the case of the letting of space on the North Eastern and Great Northern sections. All communications should be addressed to Advertising Manager, Commercial Advertising Department, King's Cross Station, London, N.1.

* * *

WE are informed by Marine & Locomotive Superheaters Ltd., of 195, Strand, London, W.C.2, that permission has been obtained from the Board of Trade and the Registrar of Joint Stock Companies to change the name of this company. This firm is, therefore, now known as "The Superheater Co. Ltd." With the exception of a very small number necessary to be retained outside, the whole of the shares of the Superheater Corporation Ltd., now called the British & Foreign Superheaters Ltd., have been acquired by the Superheater Co. Ltd., formerly Marine & Locomotive Superheaters Ltd.. and therefore, as and from January 1, 1925, the business and direction of both companies has been associated and carried on together at 195, Strand, W.C.2.

* * *

IN order to speed-up work in connection with their programme for new rolling-stock, the London Midland and Scottish Railway have placed an order for two 50-ton overhead travelling cranes for their Horwich works. These will replace the existing 20-ton cranes which have been in use for the past forty years, but which are unable to carry the larger modern engines.

* * *

AT the L.M.S. works at Horwich 20 four-cylinder superheated passenger engines are being now finished off, and their completion will be immediately followed by the construction of 20 further locomotives. These latter are to be 4-4-0 compound passenger engines of Midland design, with shortened chimney, dome and cab, in order that they may pass under any tunnels and bridges on the L.M.S. system.

* * *

ALTHOUGH, for lack of storage room, the G.W.R. historic broad-gauge relics have not been preserved, the G.W.R. contribution in connection with the Railway Centenary will include, among other exhibits, the actual driving wheels of the broad-gauge engine *North Star*, the *Caerphilly Castle*, and parts of a semaphore signal erected on the roof of the Royal saloon used by Queen Victoria in 1845—to indicate Her Majesty's wishes as to whether the train should "go quick, go slow, or stop."

* * *

IN view of the fact that the Victoria and Exchange stations of the L.M.S.R. in Manchester have now been brought under the same ownership, schemes are contemplated for associating them constructionally to a greater extent than is at present the case. One of the improvements will involve the connection of the long through platforms, which at present provide a passage from one station to the other, to form one continuous platform, which it is claimed will be the longest railway platform in the world, the total length being 2,175 ft.

* * *

THE sixty-seventh annual collection in aid of the funds of the Railway Benevolent Institution will be made under the presidency of Sir W. Guy Granet, G.B.E., Chairman of the London Midland and Scottish Railway Company, and the amount obtained will be announced at the anniversary dinner, which will be held on May 7 next, at the Hamilton Hall, Great Eastern Hotel, Liverpool Street station, when he will take the chair. It is earnestly hoped by the Board of Management of the Institution that the occasion of the centenary of British railways may be marked by a record collection being obtained for announcement at the 1925 festival dinner, but this will require the wholehearted co-operation of all in the service, and it is confidently expected that all railwaymen will do their best to bring about this desirable result.

* * *

THE Great Western Railway Company is utilising its 20-ton wagon propaganda in its displayed advertisements in South Wales newspapers. One such advertisement is headed by a view of a train of such wagons, and below, between sketches of pithead gear and a dockside coal tip, appears the injunction, "Cut your Costs by using 20-ton Wagons Pit to Tip and to Works and Depots." Particulars are then given of the South Wales Docks where the large wagons can be dealt with, together with other related information.

* * *

THE London and North Eastern Railway have placed an order for 13 4-6-2 passenger tank engines with Hawthorn, Leslie & Co. Ltd.

* * *

THE first of the Midland type goods engines now building at Crewe for the L. and N.W.

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section was completed and ran its trial trip on December 20. It bears the number 4107 and is now working temporarily between Crewe and Rugby, previous to being painted and placed into regular service. Some further 4-6-0 four-cylinder passenger engines of Mr. Hughes' design have recently been completed at Horwich for service on the L. and N.W. section, Nos. 10459 to 10465 inclusive. Six 0-6-0 shunting tanks of the 7100 class have been delivered to the L. and N.W. section by the Hunslet Engine Company, of Leeds, and nine others are to follow. The six referred to bear Nos. 7135 to 7140 inclusive. The Exhibition engine, No. 5845, *Prince of Wales* (4-6-0), which has been undergoing a slight overhaul at Crewe, was recently observed in steam awaiting its trial trip. Recent additions to class "G1" (superheater) comprise the following:—No. 2563 (class "B" compound), No. 1639 (class "G" simple), and No. 2529 (class "C" simple). All these have new standard boilers with Belpaire fireboxes. No. 1944, *Victoria and Albert* (4-4-0 compound), has recently been through the shops and is now at work again as a compound and stationed at Holyhead. Recent arrivals in the Crewe Works include No. 1923, *Agamemnon*, the last remaining of the "Jubilee" class compounds. The following additional engines are now running fitted with Belpaire fireboxes:—0-8-0 type, Nos. 351, 572, 767, 1041, 1108, 1129, 2018, 2167, 2421; 0-6-0 type, Nos. 34, 38, 54, 74, 200, 347, 348, 1267, 2466, 2468.

* * *

THE 77th and presumably final half-yearly meeting of the East Indian Railway Company on December 31 marked the close of a great record. Some interesting details of the history of the East Indian Railway Company were given by Sir David Barbour, who mentioned it was 61 years since his first journey on the railway, while, even more remarkable, Mr. C. W. Young, one of the directors, had been connected with the company for 60 years.

* * *

SINCE the two parts of Victoria station, Southern Railway, have come under the same ownership, several alterations have been in progress to facilitate inter-communication, including the construction of connecting passageways. In the South Eastern and Chatham section, No. 8 platform has been widened for part of its length by utilising the space hitherto occupied by a middle line, while the buffer stops for all platforms are now level in order to give much needed addition to the circulating area. Alterations are also in contemplation in regard to the carriageway approaches. In the "Brighton" section some of the showcases and stalls have been removed or re-arranged to facilitate movement about the circulating area.

* * *

SEVERAL readers point out that the remark recently made by a correspondent to the effect that S.E. and C. section locomotive No. 50 had been working an Eastbourne express from Victoria, is obviously incorrect, in that S.E. and C. No. 50 is a 0-4-4 tank engine. Presumably, our correspondent had not recognised "Brighton" 4-4-0 No. 50 in its rebuilt condition, and assumed it to be one of the S.E. and C. 4-4-0 rebuilds.

* * *

SEVEN hundred live trout recently travelled by London Midland and Scottish passenger train from Nailsworth, in Gloucestershire, to Cromford, in Derbyshire—a distance of 120 miles. The journey was organised by the Cromford and Matlock Angling Association, and within a few hours of their removal from their home waters the fish were swimming in their new home in the River Derwent.

* * *

LAIRAGE accommodation for cattle traffic is provided by the Great Western Railway at Fishguard to enable imported animals to be detained at the port of disembarkation for the period required by the Board of Agriculture. Although the existing lairage accommodates 1,060 animals, it has proved inadequate, and is to be increased so that additional animals to the number of 600 can be dealt with.

* * *

THE Penar branch of the Great Western Railway which runs from Penar Junction on the Vale of Neath line to Markham colliery, is at present used only for mineral traffic. In view of development and increased population it has been decided to introduce a service of auto-trains on the branch, and to provide halts at Oakdale, Penmaen, Penar Junction and Treowen.

* * *

MR. T. MORE mentions that three 4-wheeled coaches belonging to the late Hull and Barnsley Railway are now in service on the Bishop's Castle Railway in place of their old stock. The Hull and Barnsley vehicles are painted red and lettered B.C.R., but retain Hull and Barnsley photographs and other details inside.

* * *

SIX tons of fresh fish recently left Harwich for Italy by train-ferry. This was packed in 100 boxes, and is the biggest consignment ever despatched by this route.

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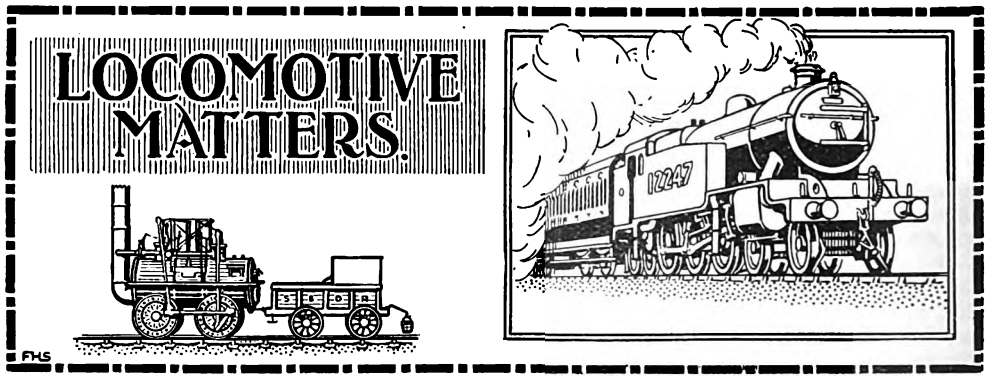

Under this heading will be inserted short references to news items relating to locomotive engines and their duties. It must be understood, however, that information as to the stations of particular engines cannot be given, for the reason that, before the date of publication, transfers may have taken place, while lists of engines, &c., debarred from "The Why and the Wherefore" section, cannot be included under this heading. With this understanding, notes as to matters thought to be of general interest will be welcomed.

L.M.S.R.

Midland 4-4-0 engine No. 341 is working on the Lancashire and Yorkshire section attached to Shed 1. Nos. 1034, 728, 200 and 1499 are included among London and North Western 0-6-0 engines rebuilt with Belpaire boilers and fitted with Ross safety valves. Wirral tank engines Nos. 4 and 17 have been working regularly into Exchange station, Manchester.—["MANCHESTER READER."]

London and North Western locomotive No. 1100, *Lusitania*, has been stationed at Lancashire and Yorkshire Railway shed No. 2. Midland engines on Manchester-London trains include Nos. 1051-4.—["EXPERIMENT."]

Highland section "Loch" class engines are apparently re-numbered 14379-96, thus covering old numbers 119-33 and 70-2. The small "Ben" class, Nos. 1-17, are renumbered 14397-14413. *Clan Munro* is now No. 14764, and *Clan Chattan* No. 14766.—["A.D.C."]

A Glasgow and South Western 0-6-0 engine, No. 84, was noted hauling a heavy goods train on the Furness section.—[A. C. COLLINS.]

Lancashire and Yorkshire 0-8-0 engine No. 1456 has been seen recently at Bournemouth and Oxford, though its visit south has been, it is understood, in connection with bridge testing trials. There is at least one regular through coal train working between Willesden and Toton *via* Rugby, hauled alternately by London and North Western and Midland engines. An ex-Highland coach, painted in London Midland and Scottish colours, was recently seen at Euston.—[G. H. CANNON.]

New three-cylinder 4-4-0 engines of Midland type have been working on several further trains from Euston, including the 8.30 and 9.45 a.m. expresses from Manchester to London, both *via* Stoke and *via* Crewe; also on Euston-Birmingham trains. The 11.30 a.m. ex Euston has, in fact, been worked at various periods by No. 1037 of the earlier compound class, No. 557 of the rebuilt 4-4-0 class, an engine of the "700" class, and new compound engine No. 1057.—[P. H. BIRTLES and B. D. DAWKINS.]

No. 10459 is the latest 4-6-0 passenger locomotive of Mr. Hughes' design to be put into service on the L.N.W. (Western Division) direct from the Horwich works. Six of the new 0-6-0 shunting tanks have also been allotted to this section, Nos. 7120 to 1247 and 7137. "Precursor" class 4-4-0 No. 113, *Aurania*, has been converted to "George V" class (superheater). No. 2563 (2-8-0 compound, "E" class) is now running rebuilt as a two-cylinder simple and is classified "G 1" (superheater). The boiler is of the new standard pattern (Belpaire) and is provided with "Pop" safety valves.—[H.D.E.]

Midland Division 2-4-0 engine No. 153 is running with a Belpaire boiler and with a modern type of safety valve on the fire-box instead of on the dome. It bears a plate lettered "L.M.S. Rebuilt Derby 1924." New compound 4-4-0 locomotives are out to No. 1072. A considerable number of the late L. & Y. locomotives have now been renumbered.—[J. G. S. GREEN.]

The five Furness "Baltic" tanks which are shedded at Barrow are mostly confined to working between there and Carnforth, there being only three trips a day to Millom and one to Lancaster. The locomotives have eight "jobs" in a day. Nos. 115 and 118 are now Nos. 11100 and 11103, and No. 117 is in the shops for "general." Of the 4-4-0's

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of the "130" class, Nos. 130, 131 and 133 are out as Nos. 10185, 10186 and 10188. The latter has been rebuilt with a new boiler, Belpaire firebox, flush smokebox and capuchon chimney, all of which are said to be of Horwich origin. The three, Nos. 10185, 10186 and 10188, are at Carnforth, and No. 132 is at Barrow shed. Three of the 6-ft. 6-in. 4-4-0's of the "126" type are out renumbered. They are 127-129, renumbered 10144-10146. No. 10144 has a new boiler of the same dimensions as the old one, and a small capuchon chimney; No. 10145 has a new (but shorter than the old) boiler, an extended smokebox and a small chimney. This locomotive is shedded at Carnforth with No. 126, and the others are at Whitehaven. Of the older 4-4-0's, Nos. 37, 45, 46, 124 and 125 are out, renumbered 10136, 10138, 10139, 10141 and 10142. The 0-6-2T's are to be renumbered as follows:—112-114 to be 11622-24; 98-107 to be 11625-34; 96, 97, 108-111 to be 11635-40; 92-95 to be 11641-44. Several of these are already renumbered, the latest out having L.M.S on a red background on the bunker sides.—["FURNESSIAN."]

The following Midland "single" locomotives have recently been noted at work: Nos. 600, 633, 635, 636, 638, 640, 660, 661, 664, 666, 667, 670, 671, 674.—[J. W. WALKER.]

Two Glasgow and South Western Railway 0-6-0's, Nos. 73 and 84, have been shedded at Workington since June, 1924. They are classed "4" in the L.M.S. power classification, and work on alternate nights a goods train from Workington to Carnforth, calling at Millom. The return working is on an empty wagon train from Oxenholme next day. These two locomotives replace two London and North Western Railway 18-in cylinder 0-6-0's, and a London and North Western Railway 4-6-0 mixed-traffic locomotive No. 2123 has replaced a 4-ft. 3-in. wheel 0-6-0 of the same railway at the same shed. This engine regularly works goods traffic between Workington and Millom. An ex C.R. 0-6-0 No. 17617 has been observed on an empty wagon train from Carnforth to Workington. During July, August and September last, an L.N.W. "Experiment" worked every weekday an excursion from Morecambe to Barrow. The following three were seen at different periods, No. 1483, *Red Gauntlet*, No. 1616, *Lancashire*, and No. 2040, *Oliver Goldsmith*. The Leeds (Stourton sidings) to Barrow coal train, and the corresponding return empty wagon train have been running now for over 15 months, worked on alternate days by Leeds men with class "3" 0-6-0's numbered in the 3700's, and Barrow men with Furness section 0-6-0's numbered 12496-12514. Every Saturday and Sunday morning in July, August and September, excursion trains were worked from Leeds to Windermere (Lake-Side) by Midland class "2" 4-4-0's, and on Saturdays only a passenger train was worked from Leeds to Barrow and back by a similar locomotive. The morning service of trains between Grange-over-Sands and Kendal has been worked for some months now by an L.N.W. "Precursor" tank engine of Oxenholme shed.—["FURNESSIAN."]

An old North Eastern Railway coach in charge of a "Drummond" 0-4-4 tank engine was noted at Barnstaple making clearance tests on the Ilfracombe route. Lynton and Barnstaple Railway coaching stock is now being painted and lettered according to the style adopted by the Southern Railway.—[A. HALL.]

New Midland 0-6-0 locomotives Nos. 4027–4036 are now in service, while the compound 4-4-0's with 6-ft. 9-in. coupled wheels are now running to No. 1084. Several Midland 2-4-0 locomotives are being rebuilt with Belpaire fireboxes and ordinary safety valves.—[ASHPAN.]

L.N.E.R.

Referring to notes as to L.N.E.R. (N.B. Section) locomotives as published in the December number, several of the large "Drummond" 4-4-0 tank engines, including Nos. 494-6, have been given duplicate numbers, and after being concerned in recent renumbering now bear the numbers 10390-2. Further "Director" class 4-4-0 engines are now at work on the Edinburgh and Glasgow line, including Nos. 6395, 6399 and 6400, all built by Armstrong, Whitworth & Co.—[C. E. S. LITTLEJOHN.]

4-6-2 engine No. 2547 recently worked the 8.45 a.m. express from Marylebone. (This engine is apparently shedded at Gorton.) Darlington-built 3-cylinder 2-6-0 locomotives Nos. 69 and 73 have been seen working on the Great Northern section in the London area. G.N. 4-4-0's Nos. 3042 and 4336 have been fitted with chimneys similar to those of the "4630" 2-6-0 class. G.N. rail motor coach No. 2 has been working attached to Neasden shed. G.E. 2-4-0 No. 7501 recently worked the 1.45 p.m. train from King's Cross. G.E. 0-6-0 tank engines Nos. 43, 46, 87, 385, &c., have now left the Hornsey district, G.N. section.—[C. STEVENS.]

4-6-2 engine No. 2548 has been stationed at Gordon shed.—["EXPERIMENT."]

4-6-0 engine No. 825, now that the Stumpf uniflow cylinders have been removed, has two cylinders only, and not three, as stated by one of our correspondents recently.

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It now corresponds substantially with other 4-6-0 mixed-traffic locomotives, except that it has a G.N. type of snifting valve. The date of conversion at Darlington is March, 1924. New three-cylinder 2-6-0 locomotives Nos. 39, 46, 52 and 53 are now at York and take regular turns with the N.E.R. class S3 locomotives.—[P. R. WALLIS.]

4-6-0 engines of the "Sir Sam Fay" class have been noted recently working the 3.20 p.m. express from Marylebone. These include Nos. 5,423-5, generally on Tuesdays, Thursdays or Saturdays, when Gorton locomotives work this train.—[G. H. CANNON.]

Great Northern "Atlantic" locomotives mentioned as working to Banbury actually work through on certain trains as far as Swindon.—[J. P. PARKER.]

Darlington-built three-cylinder 2-6-0 locomotives Nos. 69 and 73 are working on the Great Northern section. Great Eastern 0-6-2 tank engines Nos. 992-5 are now working from Hatfield to Hitchin.—[J. R. WHITTLE.]

Caledonian 0-6-0 locomotives which have been seen in service near Preston are stationed at Wigan. An L.N.W. 0-6-2 tank engine, No. 780, was recently noticed at the Knott End shed. Several L.N.W. 0-8-0 locomotives have been fitted with new boilers having Belpaire fireboxes. The reference on page 447 of the December RAILWAY MAGAZINE to a Knott End locomotive being the only 2-6-0 on the L.M.S.R., should be interpreted to apply to tank engines only, as there are, of course, 2-6-0 tender engines on both the Caledonian and Glasgow and South Western sections.—[J. E. ASHWORTH.]

Kitson-built "Director" class locomotive No. 6386 is now at Dundee, Nos. 6387-8 are at Perth, and No. 6389 at St. Margarets. Of the Armstrong, Whitworth batch, Nos. 6390-2 are at St. Margarets, Nos. 6393, 6395 and 6396 at Dundee, and Nos. 6400-1 at Eastfield. No. 6397 is also working on the N.B. section. Those stationed at Dundee are fitted with tablet-exchanging apparatus for use on the Inverkeilor-Hillside section of the main line. "Scott" class locomotives No. 243, *Meg Merrilees*, and No. 9244, *Madge Wildfire*, stationed at Perth, have been transferred to Hawick, and No. 9291, *Glen Quoich*, from Haymarket to Thornton Junction. The remaining 15 Gresley "Pacific" locomotives, built by the North British Locomotive Company, are now working in the North Eastern area and are to be seen regularly in Edinburgh on East Coast expresses. They are fitted with the Westinghouse as well as the vacuum brake. N.B. "Atlantics" Nos. 9903, *Cock o' the North*, and 9904, *Holyrood*, have been rebuilt with superheater boilers and 21-in. cylinders. Since the closing of Berwick engine shed and the transfer of N.B. engines to Tweedmouth, North Eastern locomotives have been noted on the Berwickshire branch lines. North Eastern locomotives from Tweedmouth shed are sometimes used for ordinary passenger trains to Edinburgh and for goods traffic.—[W. D. M. STEPHEN.]

G.E. Section 4-4-0 locomotive No. 1846 has been rebuilt as a "Super-Claud" and renumbered 8846.—[G. H. YOUNG.]

One of the Gresley three-cylinder 4-6-2 locomotives, built by the North British Locomotive Company for the L.N.E.R., No. 2563, has been named *William Whitelaw*, in honour of the chairman of the L.N.E.R. This engine is stationed at Haymarket shed, Edinburgh. Fifty 0-6-2 suburban tank engines, of Great Eastern design, are to be constructed at the Gorton Works of the Great Central Section.—[A. J. C.]

While it is true that Great Northern "compound" 4-4-2 engines Nos. 1300 and 1421 were rebuilt as two-cylinder "simple" engines, No. 292 (now 3292) still remains a "compound." It usually works between Peterborough and Grimsby. Certain East Lincolnshire trains work through between Peterborough and New Holland, and do not finish their duty at Grimsby Town. As a result, improved connections are provided, while congestion at Grimsby Town is avoided. Local work is usually performed by Great Northern 2-4-0 and 4-4-0 tender engines and 4-4-2 tank engines, together with Great Central smaller 4-4-0's. Some of these engines have been fitted with wind shields on the tenders for backward running. Two express goods trains in each direction run from Scunthorpe to Grimsby and March *via* Spalding, and are worked by Great Central 2-8-0 or Great Eastern superheated 0-6-0 locomotives. An express excursion train, when run on Thursdays from Grimsby to London, is generally worked by a Great Central four-cylinder mixed-traffic locomotive from Immingham. A similar locomotive is generally used for the through train from Grimsby at 12.59 p.m. for Leicester. This train usually consists of three standard Great Central bogie coaches with up to 30 fish vans behind. Locomotive classes stationed at Immingham include Great Central four and two-cylinder 4-6-0's, 2-8-0's, 0-8-0's, 0-6-0's, 4-4-0's, and 2-6-4 and 0-8-4 tank engines; Great Northern 0-8-0's, 0-6-0's, 4-4-0's, 2-4-0 and 4-4-2 tender and tank engines; Great Eastern 0-6-0's and North Eastern 4-6-0's, together with various 0-6-0 shunting locomotives.—[J. D. ROBINSON.]

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G.W.R.

Nearly all passenger traffic on the Shrewsbury-Hereford Joint Line is worked by Great Western locomotives, principally of the "Saint," "County," "Flower," or 2-6-0 classes. There is, however, one train which is worked from Shrewsbury by a London Midland and Scottish locomotive and which returns with the 7.55 p.m. mail train from Hereford. The 1 p.m. from Shrewsbury has for some time been worked alternately by a Great Western "County" class locomotive and by a London Midland and Scottish Railway "Prince" class 4-6-0. Goods traffic is principally worked by London Midland and Scottish Railway 0-8-0 and 0-6-0 locomotives, though sometimes 4-6-0 and 2-8-0 (R.O.D. type) engines are employed. The Clee Hill line has been worked by a London Midland and Scottish 0-8-0 engine and by a Great Western Railway light 2-6-2 tank engine, both being stationed at Ludlow.—[F. H. PREECE.]

Several of the new 0-6-2 tank engines are now in service. Among G.N. and G.C. engines noted as working to Oxford, G.W.R., through services from Sheffield and Nottingham work through to Swindon, arriving at 4 a.m. and leaving at 9.5 p.m. Among the locomotives which have been noted on this train are G.N. engines Nos. 4449, 4428 and 4458, G.C. fish engines Nos. 6104 and 6099, and occasionally G.C. four-cylinder engine No. 5472.—[H. ROBINSON.]

S.R.

"Brighton" section 4-4-0 engine No. 70 has been running with the name *Devonshire* on the left-hand side only. Among engines repainted in the new style may be mentioned "Brighton" section 4-4-0's Nos. 201, 208, 211, 321, 323, 46, 51, 57, 58 and 62; "Stroudley" 0-4-2 engines Nos. 177, 183, 618 and 619; express tank engines Nos. 79, 88 and 333, *Remembrance;* and "Atlantics" Nos. 37, 422 and 424.—[N. H. HAYWORTH.]

Several 4-4-0, as also 0-6-0 and 0-4-4, tank engines were designed by Mr. H. S. Wainwright for the South Eastern and Chatham Railway. Additional look-out windows have been fitted to the cabs of some of the Wainwright locomotives. The 2-6-4 tank engine No. 790 has now been painted and lettered in the new style.—[E. H. ROBBINS.]

All the new 4-6-0 engines of the "473" class are now in service, five being stationed in London and the remainder at Bournemouth.—[G. H. CANNON.]

With reference to the remarks of Mr. E. R. Simpson, quoted on page 500 of the December RAILWAY MAGAZINE, he has apparently mistaken a S.E. and C. locomotive for one belonging to the "Brighton" section. It is also pointed out that the 6.40 p.m. Victoria to Eastbourne and Littlehampton is usually worked by a rebuilt 4-4-0 of the No. 55 class, which includes No. 50.—["SOUTHERN FOREMAN."]

Freshwater, Yarmouth and Newport locomotives Nos. 1 and 2 are now Southern W 1 and 2. Isle of Wight Central locomotives retain their old numbers (W 4—W 12). Isle of Wight locomotive *Ventnor* is now W 15 and still retains the name.—[R. A. WHEELER.]

S. & D.J.R.

Most of the S. & D.J.R. engines have the class numbers and the name of the shed to which they are attached painted on the side of the cab. On the main line most of the passenger trains are worked by the 4-4-0's, of which there are 13 in number. Five of these, Nos. 67-71, are similar to the class "2" superheater engines of the Midland Division of the London Midland and Scottish Railway, while the other eight comprise two 6-ft. engines, Nos. 77 and 78, built in 1908, and six 5-ft. 9-in. rebuilt engines, Nos. 14-18 and 45. The new superheater 0-6-0's Nos. 56-61, and the Belpaire rebuilds Nos. 62-66 and 72-67 are also used on main line passenger trains. The 0-4-4 tanks work on the Burnham line and also on the Bridgwater and Wells branches. The 0-6-0's Nos. 19-24, built in 1874 by John Fowler & Co., of Leeds, were rebuilt some years ago with the Deeley type of boiler and 160 lbs. pressure, while the roofs of the Stirling cabs were extended. One of the new L.M.S. compound engines, No. 1065, is working on the Somerset and Dorset Line.—["CONSOLIDATION."]

Irish Railways.

It is understood that the 2-6-0 Woolwich Arsenal locomotives which are being converted for service on the Midland Great Western section of the Great Southern Railway will be numbered 54–58. Apparently, Mr. Murray is in error in stating that M.G.W.R. class "F" mixed-traffic engine No. 35 was built in 1923, as it bears the date 1924.—[P. H. CLEMENTS.]

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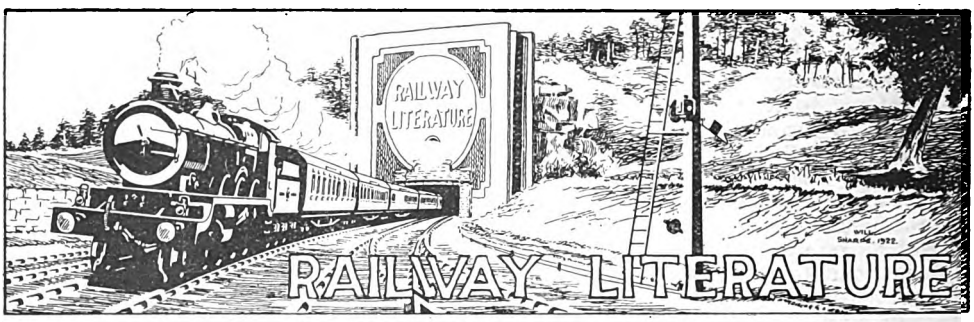


RAILWAY POINTS AND CROSSINGS. By A. A. G. Dobson, A.M.Inst.C.E. [Crosby Lockwood & Son, Stationers' Hall Court, Ludgate Hill, London, E.C.4. Price 6s. net.]

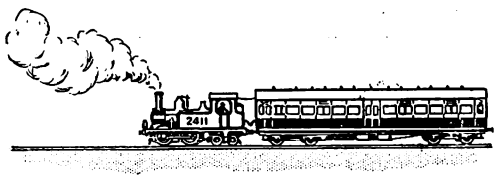
This addition to "Lockwood's Technical Manuals" is described as "A Survey of Problems Encountered in Actual Practice, and their Solutions." It is liberally illustrated by diagrams "more particularly intended for the engineer or draughtsman who finds himself called upon to prepare plans of turnouts, crossovers or diamonds for places where the existing lay-out does not admit the use of standard types." It is explained that all the cases dealt with have actually occurred during the author's routine work on railways.

Beginning with a few elementary explanations the book deals first with turnouts, sidings, &c., proceeding to gathering lines or ladder tracks, square crossings, diamonds, slips, crossovers, double junctions, scissors crossings, and three-throw and tandem switches. The letterpress is short and concise, with calculations and formulæ here and there as required. The great point is, in fact, the wide selection of connections covered, largely unusual or special. An appendix deals with turnouts at the tangent of a main line transition curve, while 24 plates set forth diagrammatically various phases of calculations involved in designing lay-outs as described in the text. This volume will no doubt be welcomed by permanent-way engineers generally and should be of considerable value also to the permanent-way staff as a whole.

MESSRS. WATERLOW & SONS LIMITED, the well-known printers, send us specimen copies of three wall calendars for 1925 just issued by them. All are good, and one especially so. This consists of a rich gold surface upon which, printed in dark brown ink, is a remarkably fine view of St. Paul's and the river, taken from Bankside, below which is a monthly tear-off calendar, the whole surrounded by an exceedingly effective Greek border. The other two calendars are printed in red and blue, and red and black, respectively—the former on a card showing the full 12 months and the latter upon 12 sheets strongly secured at the top and perforated for the purpose of tearing off; some information relating to postal regulations adds to the value of the production.

A CATALOGUE has been received from the Richards-Wilcox Canadian Co. Ltd., describing their door hangers, hardware specialities, &c. Their English representatives, E. Hill, Aldam & Co. Ltd., 93, Stamford Street, London, S.E. 1, will be pleased to supply further particulars to interested readers.

MESSRS. RICHARD TILLING, printers and stationers, of 106, Great Dover Street, London, S.E. 1, send a copy of their 1925 calendar, a good example of clear printing and presentment of essential information in a useful form.



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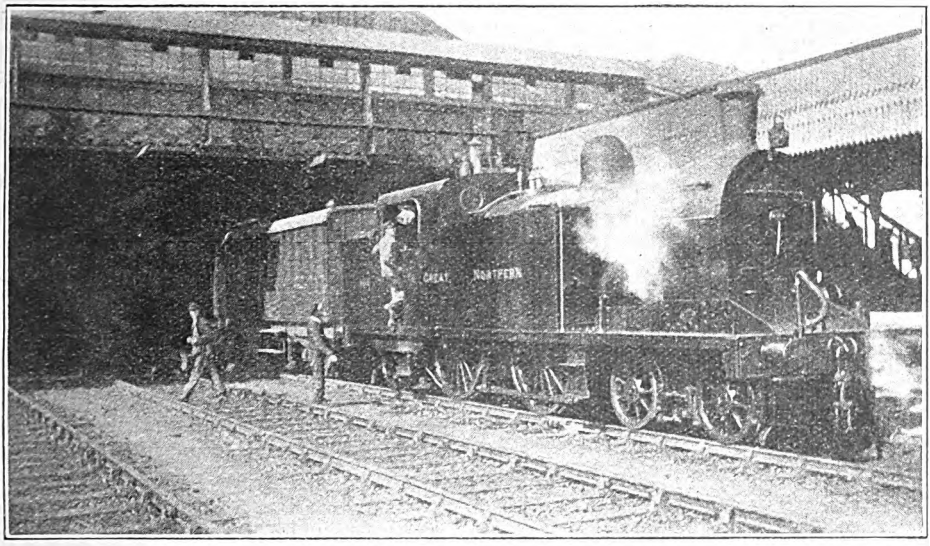

Photo.] **GREAT NORTHERN RAILWAY OF IRELAND.** [*J. Macartney Robbins.*

10.45 Dublin–Drogheda train at Amiens Street station. 4-4-2 Tank Engine No. 185, rebuilt with superheater, etc.

Local Train Services in Ireland.

By J. MACARTNEY ROBBINS.

SUNDAY, in Ireland, is a day on which people desire to enjoy themselves, and consequently move about, this being the case in and around Dublin. The railway companies in many instances have done much to encourage local travel, and in a number of cases the train services on this day are as frequent as those in operation during the week. Indeed, round about Dublin, they are in fact increased. Belfast, Cork and Waterford can also boast of constant services to local places, but these are not so numerous as those to and from the capital of the Free State.

The services of local trains completely eclipse those provided for long-distance travellers. Main line trains are singularly few and far between. In fact, on many sections of line no Sunday service is given at all. It will be noticed, for example, that no booked trains are run between Dublin and Galway or Sligo on the Midland Great Western, while on the Great Northern the Portadown to Londonderry section is closed, with the exception of the line between Omagh and Londonderry. As a general rule, there is about one booked service on Sunday, in each direction, but this does not include a large number of excursion trains which are run in connection with various events throughout the country, such as political meetings or sports contests.

During the summer, the Dublin and South Eastern line runs a train from Harcourt Street to Wexford at 9.25 a.m., returning from the latter town at 6.15 p.m. In the days before the war, this train had a restaurant car attached. The Great Northern boasts of one Dublin to Belfast express on Sundays, but has provided two expresses in the opposite direction, one leaving the Great Victoria Street station in Belfast at 10.30 a.m. and the second at 4.45 p.m., which has through coaches for Dun Laoghaire pier, in connection with the cross-Channel boat. The journey from Dublin to Cork is an event which should live long in the traveller's memory, by reason of utter weariness. The distance is 165½ miles, and the time occupied 6¾

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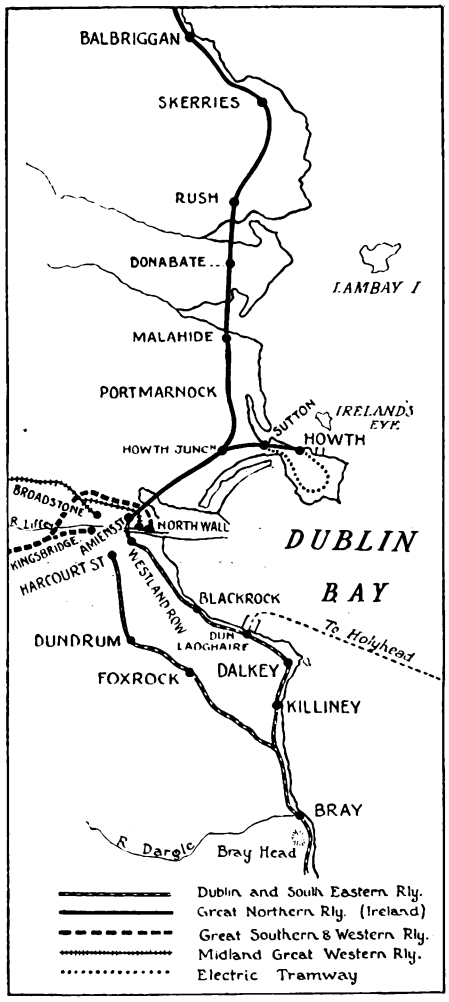

hours. No dining car is provided to help pass away the tedious journey, and the same remarks apply to the journey in the reverse direction. One would have thought that an evening express in each direction would have been worth while running for the sake of week-end travellers desiring to be back at work early on a Monday morning.

In Northern Ireland the services are better. The L.M.S. (N.C.C.) has provided a couple of trains from Belfast to Portrush. The first leaves at 8 a.m. and gives facilities for wayside travellers to visit this seaside resort. The second train leaves at 9 a.m. and is an express, calling only at Greenisland, where a stop is necessary, as the train has to reverse its direction. In the evening the trains leave Portrush at 6 p.m. and 7.20 p.m., the express being the second. The Great Northern Company, besides catering for travellers between Dublin and Belfast, also provides facilities for reaching Newcastle (Co. Down) and Bundoran, a seaside town on the west coast. The trains to this latter town are from Cavan and Londonderry, but not Belfast.

Dublin is well situated near mountains and most attractive country, and has the added advantage of being in close proximity to the sea. It is no uncommon sight to behold numbers of small children taking train to Booterstown and Blackrock, on the Dublin and South Eastern line, in order to play on the shore at low tide. To the south of the city lie Killiney and Bray, both favourite resorts of Dublin people. Killiney Bay possesses a pleasant strand within a few yards of the station of that name, and during the summer, when the weather is propitious, many picnic parties may be observed encamped along the sandy beach. The town of Bray nestles under a bold head of volcanic rock, which thrusts itself into the sea at the south end of a lengthy parade. An excellent walk can be made round the head and on to Greystones, from which there is a good service of trains back to Bray and Dublin. Inland, the country is most picturesque, and tourists can visit Enniskerry and the Dargle, either by car or on foot. Bray is also a good centre from which the tourist can make excellent excursions into the beautiful country in the neighbourhood of the Wicklow mountains.

Dun Laoghaire (better known to English people as Kingstown) is alive with people on Sundays. There is an excellent promenade facing the mail pier, and during afternoons and evenings in summer a band plays in the public gardens, and on the east pier, in addition to which the cinemas are all open. The corporation of Dun Laoghaire has recently completed a wide sea road from the bathing place to Sandy Cove Bay. This is an immense improvement, as people who so desire can drive along the sea from Monkstown to Killiney almost without a break.

North of Dublin lies the Hill of Howth, served by the Great Northern Railway. This is another popular place of resort for the citizens of Dublin, and enterprising

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caterers have erected tea and refreshment places, as a meal of some kind is usually welcome at the conclusion of a walk round the cliffs or a scramble up to the highest point of the hill. A magnificent view of the Dublin and Wicklow mountains can be had looking southwards across Dublin Bay, whilst to the north beyond Ireland's Eye one can see the Mourne mountains without much difficulty. There is an added attraction to a visit to Howth Head, as the Great Northern Company owns an electric railway running from Sutton to Howth station. This small line climbs to within easy walking distance of the summit of the cliff walk, and travellers need not make the long walk thither in both directions.

In order to cater for travellers going to Dun Laoghaire, Killiney and Bray, the Dublin and South Eastern route carries a continual service of trains from Dublin. Starting with the 12.37 p.m. from Amiens Street, a half-hourly service of trains is run to Bray, which continues until 11.8 p.m. These trains leave Westland Row station at 15 and 45 minutes past the hour. Sandwiched in between the Bray trains is yet another half-hourly service to Dalkey, leaving the same station at the hour and half-hour. This means that places such as Blackrock, Dun Laoghaire and Dalkey have trains arriving every 15 minutes, and the return service to Dublin is the same. It will, therefore, be evident that on Sundays, Bray has a superior service to that in operation during the week. The service during the week is an hourly one, except between the hours of 8 and 9 a.m. and 4.30 and 6.45 p.m. This is probably unique as regards the British Isles.

Westland Row is the largest Dublin station of the Dublin and South Eastern line, but, as stated elsewhere, a number of trains start from Amiens Street. The Dublin and South Eastern trains run alongside platforms close to those used by the Great Northern. This makes it easy for passengers from South Dublin to visit places on the Great Northern and *vice versa*. The former railway company also owns another terminus in Dublin, *i.e.*, Harcourt Street. This station is principally used by the Wexford trains, but at the same time an excellent service is maintained to and from Bray. The line runs inland and passes through the well-populated district of Foxrock, and close to the Leopardstown racecourse. On weekdays the service between Harcourt Street and Bray consists of thirteen trains, excluding the two non-stop trains running to Wexford,

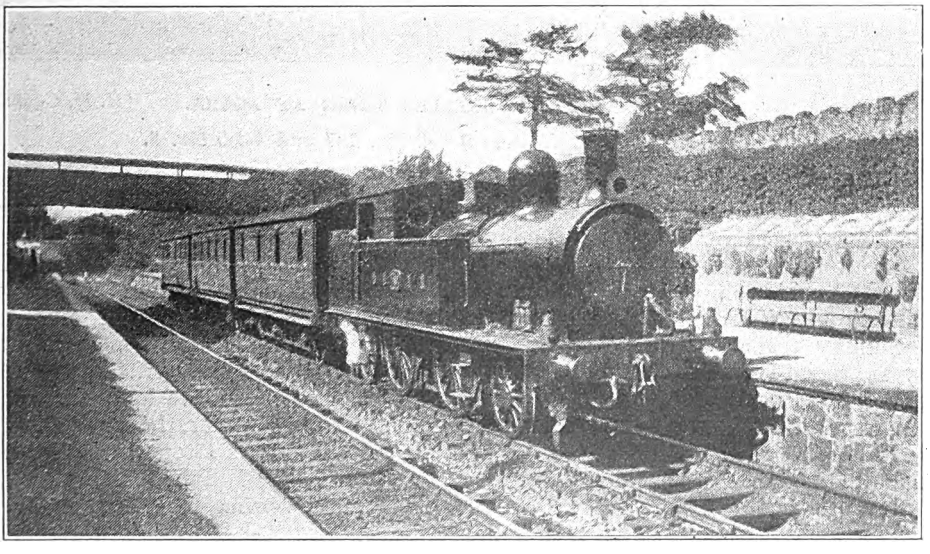

Photo.] [*J. Macartney Robbins.*

DUBLIN-DALKEY TRAIN NEAR GLENAGEARY.
Dublin and South Eastern 2-4-2 Tank Engine No. 40.

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between 12 noon and the last train. On Sundays there are twelve, which shows that the service is almost as frequent. The number of return trains is the same.

Heavy demands are, therefore, made upon the rolling stock of the Dublin and South Eastern Company, and almost every class of engine is pressed into service to cope with the traffic. This includes the two superheated 2-6-0 type, built by Messrs. Beyer and Peacock, Manchester. These machines, however, are more often employed to work excursion trains from Dublin to places south of Bray, but on weekdays are replaced to their normal work of hauling goods trains to and from Wexford. Recently two new tank engines of the 4-4-2 classification have been delivered to this company, and will prove a welcome addition. Those who have seen the Sunday traffic on this railway will fully appreciate the efforts of the Dublin and South Eastern Company to cater for travellers desiring to visit the stations on the Dublin side of Bray.

The management in charge of the Traffic Department of the Great Northern Company has not been slow to recognise the importance of Sunday travelling, and have given very adequate and frequent service of trains to local stations in the vicinity of the Free State capital. Howth is not the only place catered for, and many people enjoy spending Sunday afternoon at resorts situated on the main line between Dublin and Belfast as far out as Skerries and Balbriggan, a matter of 18 and 22 miles from Dublin. Both Portmarnock and Malahide boast of good golf links, and farther north the main line approaches within easy walking distance of the sea. The shore is skirted by a pleasing strand, and is much frequented by picnic parties.

The weekday service of trains, excluding Saturdays, to Howth consists of twelve trains after 12.30 p.m., but on Sundays, during the latter part of June, the number was as high as twenty during the same period. After 2.30 p.m. trains leave Amiens Street every half-an-hour until 10.30 p.m. Prior to the war, Mr. Glover, the Chief Mechanical Engineer, had some three-coach sets constructed for this service, but these have long since proved to be inadequate for the passengers and are nearly always strengthened with two or more coaches. It will be noticed that the Sunday service to Howth is far more frequent than that in operation on weekdays, and the trains more numerous than those listed for Saturdays.

Malahide is served by ten trains on

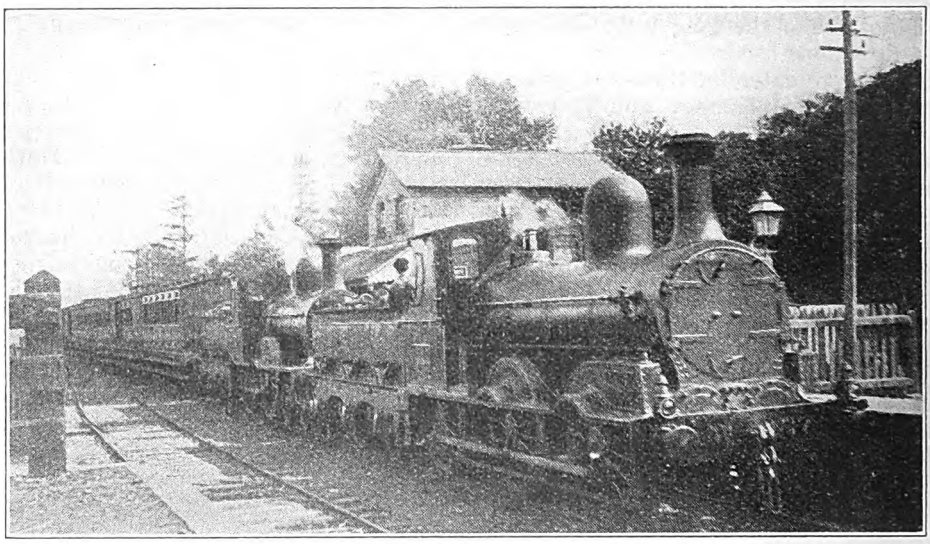

Photo.] GREAT SOUTHERN EXPRESS TRAIN AT ADARA. [*H. H. Coghlan.*

Great Southern and Western 0-6-0 No. 187 and 4-4-0 No. 8.

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weekdays, and this is increased to twelve on Saturdays, the Sunday service being the same in point of numbers after 12.30 p.m.

As on the Dublin and South Eastern line, the Great Northern has to work at high pressure on this day of the week, and a heavy demand is made upon the rolling stock. The fine superheated tank engines of Mr. Glover's design, 4-4-2 type, Nos. 1-5 and 185-189, which have been augmented by a further batch of similar engines recently delivered by Messrs. Nasmyth, Wilson, of Patricroft, are employed on this work and do yeoman service.

It should also be stated that a new halt has been opened at Killester, a growing suburb north of Dublin.

The Sunday train services on the Great Southern and Western and Midland Great Western railways are practically non-existent.

Turning now to other parts of the Free State, one finds there is not much to comment upon. The Cork, Blackrock and Passage line appears to be the most enterprising in the Cork area. This railway sets out in a small way to cater for Sunday travellers. The afternoon service is about the same as that provided for passengers during the week, so the country on the west side of Queenstown Harbour is within easy access of Cork, but on the opposite shore, the Great Southern and Western trains to Queenstown are less numerous.

Tramore is a favourite seaside resort of the people living in Waterford, and the Company serving the two towns has thought it worth while running eight Sunday trains to meet public demands.

Before leaving the Free State, mention should be made of the Dundalk, Newry and Greenore section of the L M S. Four trains in each direction are run from Greenore and Newry, but only two between Greenore and Dundalk, as the country served by the latter section of line is less populated. These were well patronised during last summer, after taking the poor state of the weather into consideration, especially from Newry. The townsfolk of Newry have taken kindly to the afternoon trips which can be made to places in the Free State, and the company has, in consequence, benefited by this.

Belfast, the capital of Northern Ireland, is situated at the end of the Lough of that name. There are a number of most attractive spots along both shores of it. The southern side is served by the Belfast

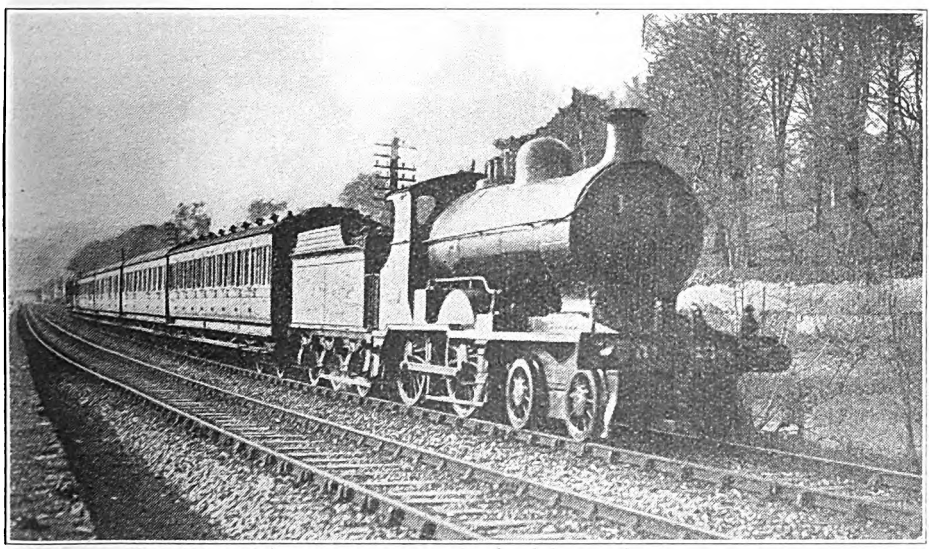

Photo.] CORK-QUEENSTOWN TRAIN NEAR DUNKETTLE. [*R. Murphy.*

Great Southern and Western 4-4-0 Locomotive No. 334.

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and County Down company, whilst along the opposite shore the L M S (N.C.C.) provides for the travelling public. Great Victoria Street station, situated in the south-western part of the city, is the terminus of the Great Northern Railway. This company serves the country towards the south and also conveys passengers to the centre of Ireland, as well as providing an alternative route to Londonderry. A large and comprehensive traffic is dealt with in and out of Belfast by this company, but the Sunday local services are far below those in operation around Dublin. There appear to be more longer distanced trains. Only eleven trains leave Great Victoria Street on Sundays, and these include two expresses for Dublin. Of recent years the traffic to Newry and Warrenpoint has increased considerably, with the satisfactory result that there are three services for Belfast citizens. The first is at 9.30 a.m., the second at 10.30 a.m. and the third at 2 p.m. The second morning service is in connection with the Dublin express, but on occasions the Warrenpoint portion has had to be run separately. No doubt as time proceeds additional trains will be provided on this day of the week, since it is evident that Sunday travelling is on the increase. Another factor is the rapid growth of road transport, and in order to combat this competition the railways will have to give increased facilities.

Commencing with the 1.15 p.m. from Queen's Quay terminus, the B. & C.D. Company provides a service of twelve trains in each direction between Belfast and Bangor, the latter town being a popular seaside resort. The large 4-6-4 tank engines are used to work trains over this section, which has a number of severe gradients. The same company also runs a competitive service to Newcastle, Co. Down.

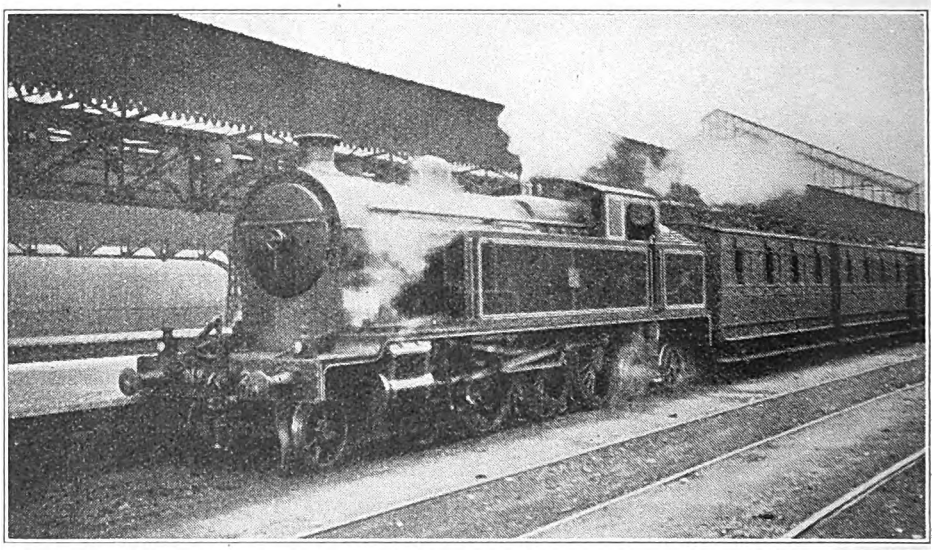

Photo.] **BANGOR EXPRESS AT BELFAST.** [*S. B. Jackson.*

Belfast and County Down 4-6-4 Tank Engine No. 23.

The service in operation on the Northern Counties Committee is not quite so frequent. Eight trains each Sunday are booked to run between York Road terminus and Greenisland, but the majority of these trains are extended to Carrickfergus, Whitehead and Larne.

The foregoing remarks will serve to show that the Irish railways as a whole are fully alive to the possibility of increasing their revenue by encouraging the public to travel on Sundays, especially during the afternoon.

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Recent Developments at King's Cross, L.N.E.R.

THE substantial façade to the two imposing semi-circular roofs of King's Cross terminus remain to-day much as they were 73 years ago when this London station was brought into use by the G.N.R. Within and around this famous landmark many changes and extensions in connection with the railway have taken place.

Several of these have from time to time been described in the RAILWAY MAGAZINE —in the August, 1914, issue was a comprehensive article on King's Cross in the series, "Notable Railway Stations and Their Traffic." Within the last ten years, however, various developments have taken place at King's Cross, which, with previous alterations, &c., have altered very largely the working and internal arrangement of the station. Before referring in particular to the latest innovations, it may be of interest if we sketch briefly the development from the station as constructed. Originally there was an arrival and a departure shed, separated as now by a substantial brick wall supporting one end of the ribs of each of the two roof sections. There was but one long, straight platform in each shed—the far eastern in the arrival shed, now No. 1 platform, and the main line departure in the western shed, now platform No. 10, the other twelve roads in the station being used for storage. The roof of the station is said to have been copied from the design of a then recently erected riding school, built at Moscow about 1847 for the Czar of Russia.

The first additions were apparently the York Road station for trains to the Metropolitan Railway, and the suburban station, *i.e.*, the platform used by trains from the Metropolitan line, opened in 1863. Up to the 'nineties of last century many of the morning up trains for Moorgate Street divided in York Road station, the engine and three or four main line coaches coming to a standstill on the connecting line between York Road and the main arrival platform. The train was then divided, the front part passing forward into the terminus; following which a condensing tank engine, which was provided in the siding at the junction for the purpose, backed on to the rest of the train (a close-coupled set) to take it on to Moorgate Street. The down line from the Metropolitan Railway and the suburban station were on a very sharp curve and on a stiff rising gradient. A special signal connected with catch points was provided at the approach end, and at night, during fog, &c., an inspector with a lamp also stood there to hand signal trains, as the curve prevented the signals at the starting end of the platform being seen from this point. Down goods trains from the "Widened Lines" were held at King's Cross Metropolitan until the line was clear for them through the suburban station. If one had stopped in the station it would never have got away without additional engine power.

Later, additional arrival platforms* were constructed. One platform (No. 2 arrival) extends the whole length of the station, and is sufficiently long to accommodate two standard suburban trains. At the approach (north) end this platform at its western face is indented for half its length, so that the arrival line (then No. 3) concerned is in the nature of a bay; whilst the platform face, No. 4, commences where No. 3 terminates. On the departure side an additional (short) platform was provided outside the main western wall of the station, with a line alongside and a second platform on the other side with a platform line on its western side. This addition provided two new departure platforms, but accommodated only two trains. This addition to the station was called "King's Cross Main Line (Local)" The new eastern platform was used both for local and main line trains, the latter chiefly to Manchester and the Cambridge branch.

About 1894-95 a general development at King's Cross set in. A new roof was given

* The arrival platforms were originally numbered separately from the departure platforms.

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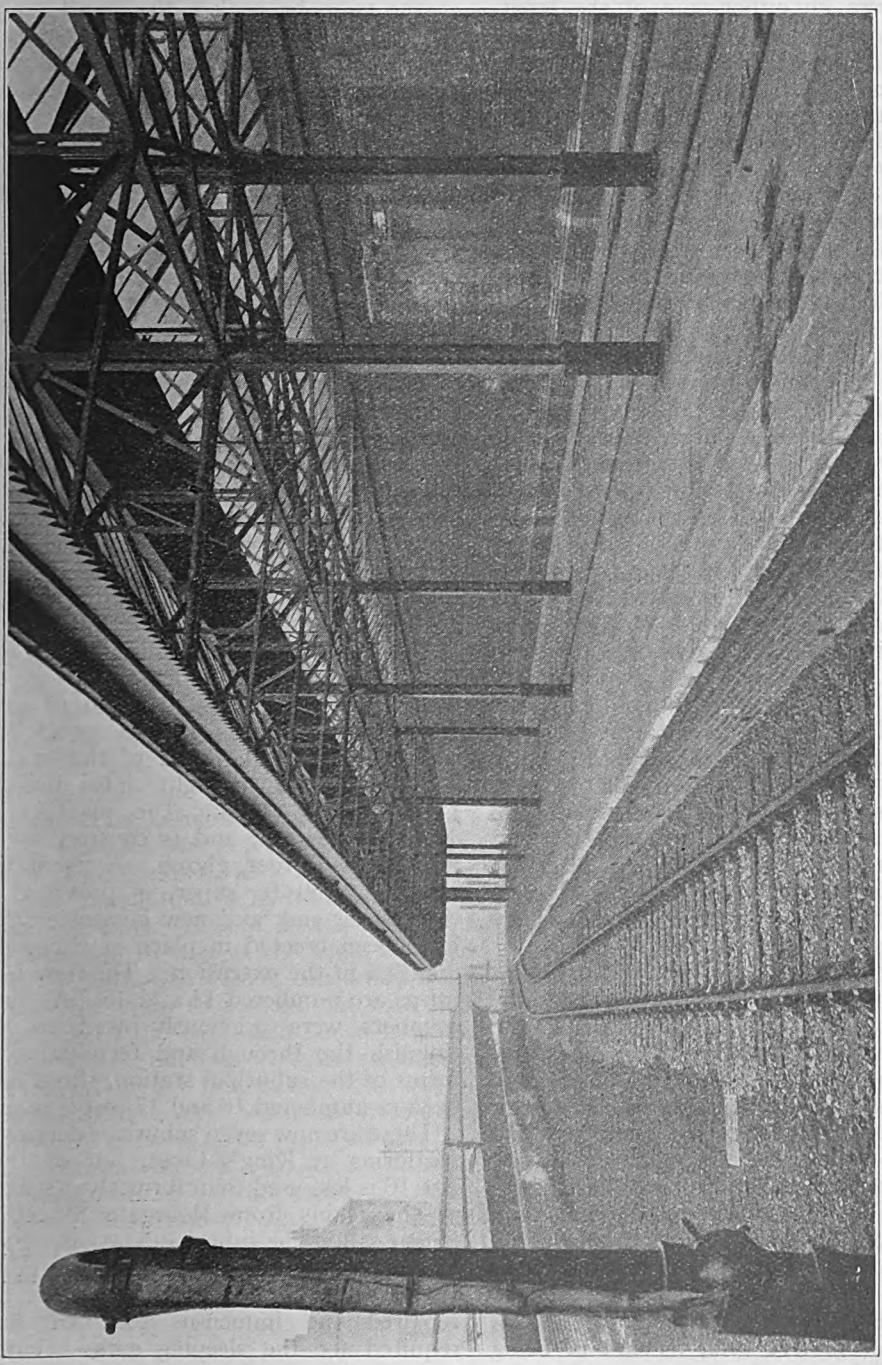

GENERAL VIEW ALONG NEW PLATFORMS.

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to the departure platform and two new platforms were provided within the station. These were on either side of the longitudinal wall dividing the arrival and departure sheds, increasing the accommodation in the arrival shed to five platform roads, whilst in the departure shed there were (as now) two platforms and six roads. An iron girder footbridge about midway of the station was erected to provide access to and from all platforms, but chiefly between the old general offices on the departure side and the new ones on the arrival side. The flights of stairs from this overbridge to the platform at first were built without a landing half-way down to break the continuity of the steps, but this defect was speedily remedied.

Improvements on the departure side were also carried out. The severe curve of the down line and suburban platform was much flattened. This enabled more ground to be added, particularly at the north end, to the west of the engine roads; but more than the addition was taken off on the east side, to enable the main line local station to be enlarged. The platform face and line next the main line platform (now No. 11) remained, but beyond was provided a two-sided platform of good width with a line on each side, in place of a narrow platform accommodating only one train. The additional terminal platform on the west side of the suburban platform was also constructed, together with the milk, horse and carriage docks in the triangular space between Cheney Street and the rear of Culross Buildings.

No further important extension to King's Cross station was effected until prior to the removal of the locomotive yard from the triangular space between the local and suburban stations, which was decided upon about three years ago. This work and improvements in the train working through the tunnels, new signals, &c., were fully described in the RAILWAY MAGAZINE for March, 1923. The new engine coaling yard and 70-ft. turntable on the west side of the north portal of Western Gas Works Tunnel was brought into use during December, 1923.

The locomotive coal, instead of being unloaded from coal wagons on to a stage and thence transferred to the engine tenders, is loaded into small trucks, which stand on a narrow gauge line, placed between and parallel to the engine line and the coal wagon line. When an engine is to be coaled, the small trucks are one by one pushed along the narrow gauge line till they are beneath a hoist, on which the truck is raised till it is above the top of the tender; it is then tilted and the coal falls on to the tender, the empty truck is lowered to the rails, and the next loaded truck is dealt with in a similar manner.

Adjoining the engine line at the new coaling stage is a siding in which an engine waiting for its turn of duty stands. From this siding is a steam pipe underground to the platforms. In winter when the coaches forming a down train are placed alongside the platform, the one end of the steam pipe is connected with the pipes of the heating apparatus of the train, and the other to the locomotive in the siding. The standing locomotive circulates steam through the underground pipe to the train, which is thus warmed without a pilot engine being engaged specially for the purpose.

The site of the old coaling stage, &c., was thus free for the extension of the local station. A new platform of good width with two faces has now been erected here to the west of the station wall, and was brought into use on December 15, 1924. The platform is 400 ft. in length, and is covered by an iron umbrella roof, glazed. A circulating area of 2,450 ft. super. is provided at the barrier end, and new lavatories, &c., have been erected in place of those dismantled in the extension. The new platforms are numbered 14 and 15. As these numbers were previously used to distinguish the through and terminal platforms of the suburban station, those have been re-numbered 16 and 17 respectively.

There are now seven suburban departure platforms at King's Cross, but of these No. 16 is less used than formerly, as many of the trains from Moorgate Street no longer call at the suburban station. From the new circulating area access is obtained to an upper floor in which is kept and repaired the immense stock of linen required for the sleeping cars, lavatory carriages, &c. During the first nine months of 1924 some 1,250,000 pieces of linen, &c. (sheets, pillow slips, towels, antimacassars, rugs and pillows), were

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dealt with in this room. So big is the stock and so complete the organisation, that if a special train be required at a few minutes' notice it can be at once equipped with towels, antimacassars, &c.

Whilst considering passenger train equipment, it is of interest to remark that the dining cars on the G.N. section of the London services of the L. & N.E.R., including those to and from Scotland by the East Coast route, are equipped from the long range of larders, kitchens and stores beneath the offices on the departure side. Here the meat, fish, poultry, &c., are kept in store, whilst large quantities of various wines and spirits are matured and stored here for the dining cars, refreshment rooms and G.N. section hotels.

The pastry and soups for the dining cars are prepared in these kitchens, the cars being fully equipped here each day. As the dining cars between England and Scotland only do one journey (up or down) a day the provisions for the up trip are taken on board when commencing the down trip, so that each day eight kinds of soup are made by the chef—one clear and one thick for the luncheon cars, the same number but of different kinds for the dining cars, and the same number but of other varieties for the up luncheon and up dining cars leaving Scotland for London the following day.

A special safety feature of the five arrival platforms at King's Cross terminus is the installation of hydraulic buffers at the dead ends. Should, by any mischance, a train fail to stop at the usual spot, the pair of hydraulic buffers concerned would bring the train to a standstill with little shaking to the passengers, even if travelling at a fair speed. An interesting rehearsal of a "buffer-stop collision" is carried out every Wednesday morning between 11 and noon, with all five sets of hydraulic buffers. To ensure that the apparatus is in working order, a locomotive pushes against each pair of buffers in turn and continues exerting power until the buffer is pushed home, a gauge on the buffer showing the pressure exerted. These buffers are supplied with water by a special cistern on the roof containing 20,000 gallons.

Amongst new features at King's Cross terminus is the battery room on the main departure platform, where the accumulators of the electric trucks which convey parcels, &c., along the platforms are charged, as well as the accumulators of the trains, with current for cooking and lighting. A 73-year-old feature of the station is the turret clock, dominating the exterior of the frontage of the station. This clock was exhibited at the first International Exhibition. The minute hands on each of the three faces used move every half-second, whilst the hands of modern railway station clocks move only every half-minute—likely to be misleading when passengers cut the time of arrival at the station too fine. There is a fourth face to the clock, but as this faces north and cannot be seen (it is hidden by the roof of the station), the figures have been painted out and the hands and driving mechanism removed. This famous clock has three bells, the largest weighing nearly a ton and a half. Talking of bells calls to mind that the practice adopted by railways a hundred years ago of ringing a bell to denote the train is about to start is still employed at King's Cross for main line trains.

Another improvement under construction is the provision of underground lavatories and bath and dressing rooms, &c., for the main line departure platform; this installation will cost £10,000. The Lost Property Department at King's Cross has been housed afresh; the L. and N.E. Railway has purchased the extensive German gymnasium at King's Cross, which fronts Pancras Road and at one side abuts on the company's station property.

A wall has been built longitudinally across the centre of the hall to divide part of the building used as the L. and N.E.R.'s Lost Property Office from the portion made over to the ever-extending activities of the Advertising Department.

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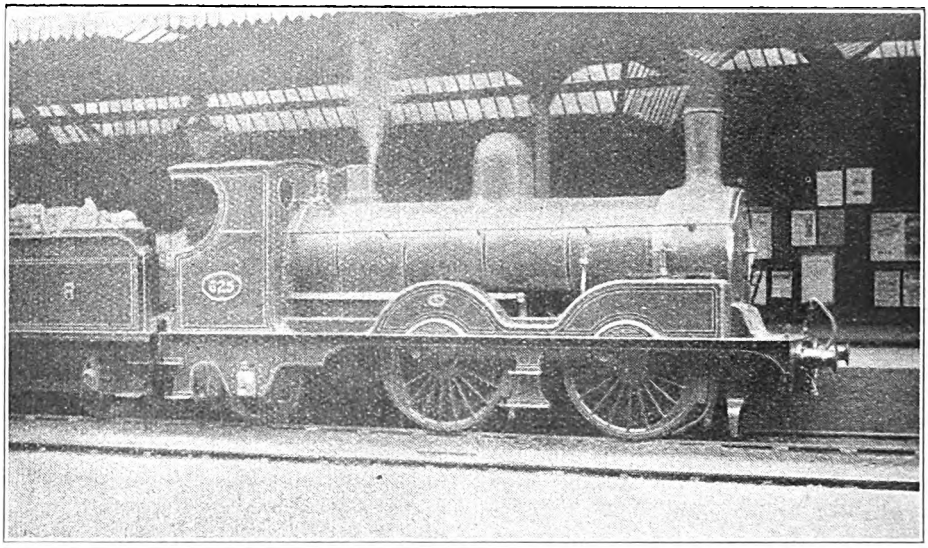

Photo.] **No. 625, AS ORIGINALLY CONSTRUCTED.** [*G. J. Prentice.*

Built by Neilson & Co., 1892.

The 0-4-2 Tender Engines of the Southern Railway (South Western Section).

By HAROLD L. HOPWOOD.

AT the close of the year 1922 the London and South Western, among British railways, possessed the greatest number of 0-4-2, or leading and driving coupled, type of tender engines, the total being 90. Built between the years 1887 and 1895, when the late Mr. William Adams was locomotive engineer at Nine Elms Works, the engines in question seem never to have attracted the attention they deserve, due to the fact that, being designed for "mixed" traffic, they have always been employed on miscellaneous duties rather than on the more "spectacular" express passenger services.

When introduced on the London and South Western Railway, this type, although far from being obsolete on other railways, was not being multiplied to any extent, only the London, Brighton and South Coast and Great Northern Railways building such engines. On these two railways the last 0-4-2 engines were completed in 1891 and 1895 respectively. In the latter year the Great Northern Railway employed more than 150 of them, but all are now withdrawn, and at the present time the Glasgow and South Western section of the London Midland and Scottish Railway comes second to the Southern (London and South Western) Railway, with a total of 55 0-4-2 tender engines, all of which, however, were constructed previously to 1879.

In view of the circumstances mentioned, it created some surprise when Mr. Adams decided to try the type on the London and South Western Railway in 1887, especially as up to that time he had been a firm adherent to four-coupled engines with leading bogies and outside cylinders for express passenger, mixed traffic, and suburban work. But the fact that no fewer than 90 0-4-2 engines were subsequently built, and are still at work, amply proves their efficiency. On most railways such engines had been of moderate dimensions, with coupled wheels about 5 ft. 6 in. in diameter, and it was left to Mr. William Stroudley to develop the type into one for express passenger work on the Brighton Railway. This he did

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by adopting 6 ft. 6 in. leading and driving coupled wheels for the "Richmond" class in 1878 and also for the more famous "Gladstones" four years later.

Mr. Adams chose the middle course, and put 6 ft. 1 in. leading and driving wheels under his new engines. Other dimensions were on a liberal scale, the result being an engine of considerable power and capable of working all trains, except perhaps the fastest expresses, on the London and South Western Railway in the year 1887. Ten were built in 1887, being the first to be constructed at Nine Elms since 1875, all engines in the interval having been supplied by outside firms. Ten more of the class followed in 1888, and a further 10 in 1889. Messrs. Neilson & Co., of Glasgow, delivered 40 in 1892 and 1893, and during the next two years Nine Elms turned out another 20, the complete list being as under :—

Numbers.	Date.	By Whom Built.
527–536	1887	Nine Elms Works.
537–546	1888	,, ,,
547–556	1889	,, ,,
607–631	1892	Neilson & Co. (Nos. 4506–4530).
632–646	1893	Neilson & Co. (Nos. 4531–4545).
597–606	1893–4	Nine Elms Works.
647–656	1894–5	,, ,,

The design was simple and straightforward, and in appearance the engines were exceedingly neat. The following is an official list of dimensions :—

Cylinders	18 in. by 26 in.	
Diameter of wheels—		
Leading	6 ft. 1 in.	
Driving	6 ft. 1 in.	
Trailing	4 ft.	
Wheelbase—		
Leading to driving ..	8 ft.	
Driving to trailing	8 ft. 10 in.	
Boiler—		
Length	11 ft.	
Diameter	4 ft. 4 in.	
Centre above rails	7 ft. 6 in.	
Tubes, number and diameter..	218 : 1¾ in.	
Firebox (inner)—		
Length	5 ft. 3¾ in.	
Width	3 ft. 4⅜ in.	
Grate area	17 sq. ft.	
Heating surface—	Sq. ft.	
Tubes	1121·04	
Firebox	110·67	
Total	1231·71	
Working pressure	160 lb.	
Weight—	Tons.	cwt.
On leading wheels	14	18
,, driving wheels	16	2
,, trailing wheels	11	5
Total	42	5

The first 30 engines had the cylinders in one casting, with steam chests underneath, but the advantages anticipated

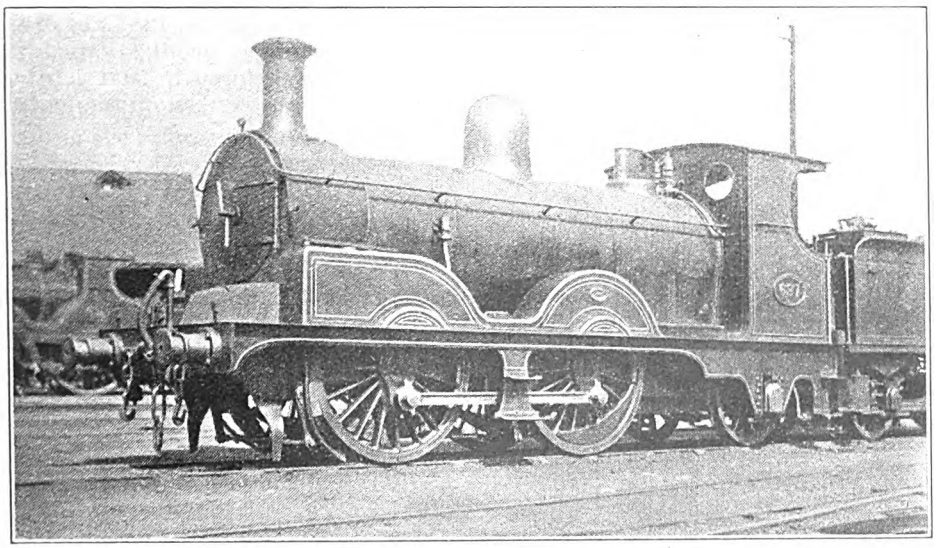

Photo.] **No, 637, FITTED WITH DRUMMOND CHIMNEY.** [*H. L. Hopwood.*

Built by Neilson & Co., 1893.

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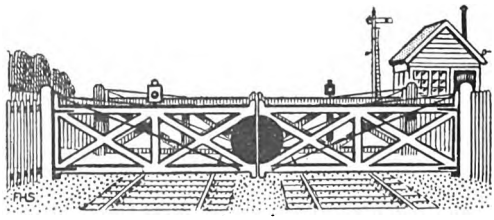
from this arrangement were not realised, and whilst in subsequent engines one casting was still used, the slide valves were arranged between the cylinders.

Nos. 527 to 553 had second-hand tenders from some of W. G. Beattie's engines, but commencing with No. 554, standard tenders of the period were provided. These carried 3,300 gallons of water and ran on six 3 ft. 9¾ in. wheels. The wheelbase was 13 ft., and the total weight 33 tons 4 cwt. The Neilson engines, and those built later at Nine Elms, had brass beading round the wheel splashers. The Glasgow-built engines also differed slightly from the others in weight, the total being 42 tons 7 cwt., distributed as under:—

	Tons	cwt.
On leading wheels	14	15
,, driving wheels	16	6
,, trailing wheels	11	6

A number of these engines were fitted with the Westinghouse, in addition to the vacuum, brake, among which were Nos. 529, 533, 538, 543, 554, 555 and 556. On page 180 No. 625, a Neilson engine, is shown standing in the old Waterloo station in the year 1900. The photograph indicates the original appearance of the class, viz., with the Adams type of chimney, and the style of painting then in vogue—light green with black bands and white edging on either side, and a border of medium brown. The number plates were painted vermilion and had raised brass figures, and the trailing wheel axle-boxes were of gunmetal, finished bright. No. 637 (see page 181) is another Neilson engine, as it appeared in 1905, with a Drummond chimney, with which nearly all of the class are now fitted. The writer has also a photograph (not reproduced) of No. 542, built at Nine Elms in 1888, as now running in the standard dark green livery, and with number painted on. This is one of the engines which had the splashers finished plain, instead of with brass beading, and the photograph is interesting as showing one of the old Beattie tenders, with which the first 27 engines of this class were originally provided. So far as the writer is aware, not one of these engines has received a new boiler of the Drummond pattern, all boiler renewals being of the same design as the originals.

These engines are to be found all over the system, from Waterloo to North Cornwall. Their duties include the working of semi-fast and stopping passenger trains, troop specials, excursions, goods trains, and specials of perishable traffic, &c. For the first 10 years of their existence they had practically the monopoly of passenger trains on the Waterloo-Portsmouth route. It is true that the so-called Portsmouth expresses of that period were timed at under 40 m.p.h., but the road is very severely graded, and the engines did well on this service, making some very fast running on occasions. The "Jubilees," as they are known, from the fact that the first lot appeared in 1887, have given every satisfaction on the varied duties they have performed, and are great favourites with the men on the footplate.



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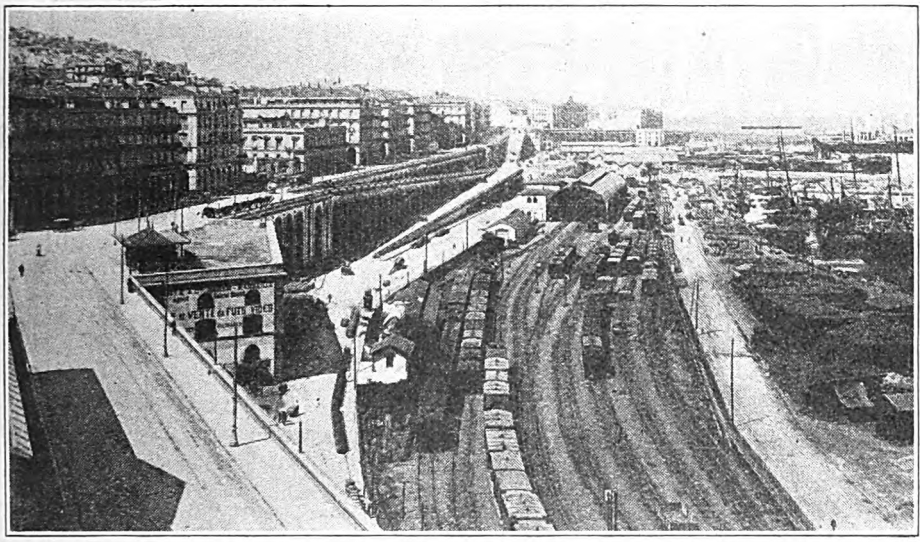

TERMINUS AND APPROACH LINES AT ALGIERS.

The Railways of Algiers.

By G. A. SEKON.

THE whole of France is not in Europe; a considerable part is in North Africa, Algeria comprising three departments. The area of Algiers is about 1,120,000 sq. miles, or nearly 13 times the size of Great Britain. The population is about 5 millions, of which less than 1 million are Europeans. Compared with the area of Algiers the mileage of the railways is insignificant, but this is partly due to the extent of its Mediterranean coast line. The principal towns are ports, and these are well served by coastwise shipping, so that competition between land and sea transport is severe.

It is less than a hundred years since the French set foot in the country, but as soon as they were established they set to work to develop communication with the interior. The railway era was just opening in France, and the iron road was introduced into its new African possessions. By 1863, the railways from Algiers to Oran, and from Phillipsville to Constantine, were by Imperial decree ceded to the P.L.M. Railway. The total mileage was 341 miles. By 1918 the P.L.M. had expended 236,079,000 fr. on its Algerian railways. The accounts of this section are entirely separate from the lines in France proper, which cannot be called upon to make good any deficit on the Algerian section.

The Algerian railway system is linked with that of Tunis on the east, and that of Morocco on the west; continuous railway communication extending from Henctir-Lebna on the coast of Tunisia to Casablanca on the Atlantic coast of Morocco, a rail distance of some 1,456 miles.

In this article we refer only to the Algerian railway systems, and our remarks are chiefly concerned with the lines in the neighbourhood of Algiers that came under our observation.

There are two chief systems—the State and the P.L.M. The trains of both the State Railway and the P.L.M. run over the same metals from Algiers, the terminus, to Maison-Carrée, a distance of 7 miles. This section of line is double and is the property of the P.L.M. Company. About 100 yards east of Maison-Carrée station the lines bifurcate, the State single line keeping to the left and eventually terminating on the coast at Bône, 400 miles from Maison-

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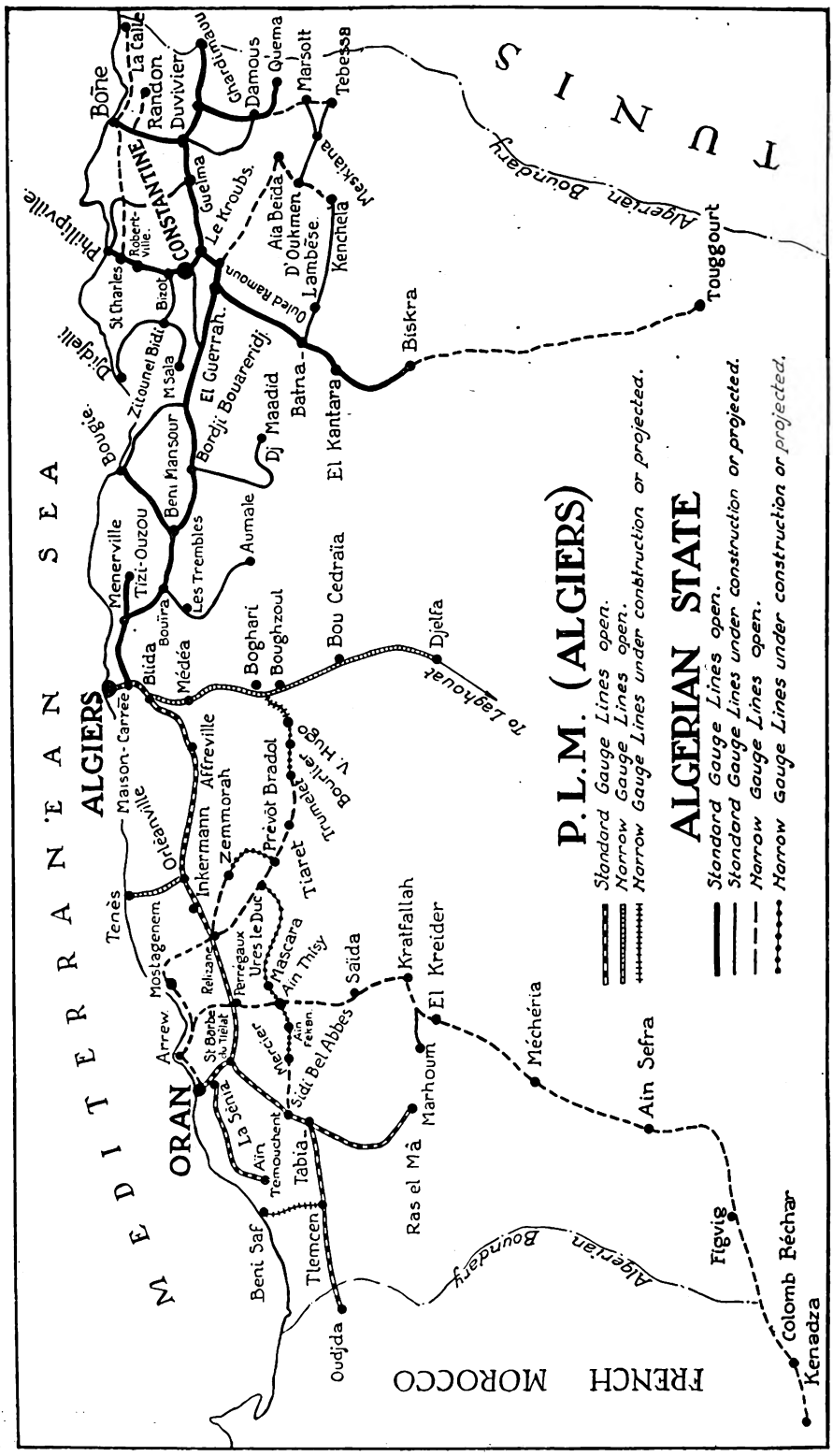

MAP OF ALGERIAN RAILWAYS.

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Carrée; the P.L.M. turns to the right and serves the western district of Algiers, terminating at the port of Oran, 256 miles from Maison-Carrée, but extended by a branch to the Moroccan boundary. Each system has several branches, many of which are (approximately) metre gauge.

From Algiers to near Maison-Carrée the railway is on ground level, with the sea on one side and the road (with electric tramway) on the other. At Algiers are extensive sidings and connections to the quays, on which also the narrow-gauge lines of the Chemins de fer sur routes d'Algérie (called C.F.R.A.) are laid, transhipping of freight between the narrow and standard gauge wagons taking place here. There are numerous level crossings normally open for vehicular traffic; the railway being protected by a red flag, the staff of which is stuck in a hole in the 4-ft. way provided for the purpose. The flag positions are about 19 yards on each side of the level crossing. Near Agha the roadway is carried across the railway by a bridge approached by inclines. This overbridge and approaches have evidently been constructed at the expense of the railway, the road, being paved with granite sets, is wide and with proper footpaths, a great advance upon the other roads in the neighbourhood. Agha, which is 2 km. from the terminus, is an important station, being more convenient for the town proper than is the Algiers station, which is on the quay. Most passengers arriving by train at Algiers alight at Agha. The locomotive depot is here, and consists of a section of a round house, with 4 lines within, reached by a turntable, and 3 other radiating lines, over which, when necessary, the round house can be extended. Briquettes are employed for locomotive fuel; immense stocks of these are stacked at Agha; whitewashed on each stack is the weight of coal briquettes forming the stack. At Agha is the engineering depot, where permanent way, &c., material is stored. Wagon sheets are repaired here; damaged tarpaulins are spread on the ground in the goods yard and repaired by native women.

A kilometre beyond Agha is Ateliers station, the parenthesis name of which is (Abattoir), situate close to the Algiers municipal slaughter-houses. The station probably takes its name from the locomotive Ateliers of the P.L.M. Railway, which are situate a short distance from the station. At these shops are repaired the P.L.M. locomotives of its Algiers system.

Three kilometres farther on is Hussein-Dey station; the place is an outer suburb of Algiers. At Agha, Ateliers (Abattoir) and Hussein-Dey, the first and second-class fares to and from Algiers are the same, viz.: 1·60 fr. first and 1·25 fr. second; the third-class fare to the first two is 85 centimes and 90 centimes to Hussein-Dey. There is practically no local passenger traffic, however, as a frequent service of electric trams runs along the parallel road.

The next station, Maison-Carrée, is 5 km. distant and 11 km. from the terminus. As before mentioned, the State and the P.L.M. systems separate here. The station has two platforms, one for all trains from Algiers, and an island platform for up trains; presumably, the P.L.M. trains use one side and the State trains the other. We noticed a big slate on the station wall, on which was written in chalk from time to time information concerning the running of the trains, &c., and when a notice on the slate was no longer pertinent, it was rubbed out by means of a sheep's tail attached by string to the slate.

At Maison-Carrée a large cattle market is held, cattle trains being run from the interior to the station. We saw a State Railway train arrive, consisting of 41 open wagons fitted with screw couplings and mostly with sides about a metre high. In each wagon was apparently loaded separate consignments, most of which comprised cattle, sheep and goats; the farmer or a drover rode in each wagon and attended to the live stock *en route*, as well as the unloading in the yard at Maison-Carrée. This merely consisted of letting down the side door of the wagon and forcing the animals to jump out on to the permanent way—easy for sheep and goats, but likely to prove injurious to big animals; the cattle, however, are small, and although several came down on their knees in jumping out, none appeared to be injured. There was nothing to prevent the animals straying all over the lines, and if there was much traffic passing when a cattle train was being unloaded, accidents to the cattle

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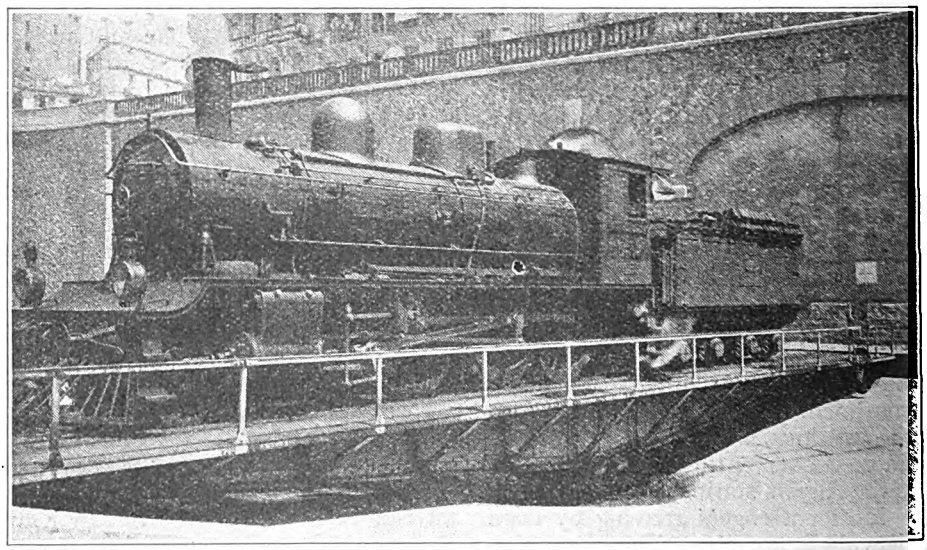
might occur. Possibly, however, unloading does not take place when trains are passing.

From inquiries we made of the station-master at Maison-Carrée, it seems that passengers between that station and Algiers are issued tickets of the system of the train by which they travel: P.L.M. tickets for P.L.M. trains, and State tickets for State trains—a plan employed on some joint lines here. The tickets are signed (initialled) by the booking clerk when purchased.

The permanent way is of flat-bottomed rails, the sleepers being cut out of small trees and roughly squared, but if the tree is not quite straight it is still employed for sleepers. We saw some old sleepers, the bolt-holes of which had worn too large to hold the rails securely, having good pieces of the other sleepers fastened over the worn parts, so as to form a secure holding for the bolts. These repaired sleepers were thus of double thickness at the points where the rails were supported. We do not know whether these repaired sleepers were used in the main line or merely in sidings. Metal sleepers have been employed on some sections of the railway. We saw numbers of these—very much corroded—piled alongside the line at Agha. At places where much shunting takes place the signal wires are supported on posts, high above ground level.

The narrow-gauge branches are of more recent construction; some are of considerable length. That of the P.L.M. from Blida to Djelfa is 175 miles long. The section between Blida and Medea, constructed in the late 'eighties of the last century, is a specimen of excellent engineering. It runs along a deep, wide gorge, half-way between the bottom and the road above, which is cut along one face of the gorge. In the rainy season a turbulent river, to a large extent fills the gorge, but when we visited it it was dry. The road can follow the twists and turns of the ravine, but these are too sharp for the metre-gauge railway, which is frequently carried by lattice-girder bridges from side to side of the gorge, and by means of tunnels cut off many of the sharp bends of the ravine. At some places the railway emerges from a tunnel on one bank, crosses the river and road by a bridge, enters at once another tunnel, and next appears at a lower level between the gorge and the road.

There is only one (mixed) train each way daily on this branch, 10 hrs. 24 mins. being spent on the journey from Djelfa to Blida. The longest distance between



4-6-0 EXPRESS LOCOMOTIVE, ALGERIAN STATE RAILWAYS.
On Turntable at L'Agha Depot.

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stopping-places is 12½ miles (Bon-Cedraia and Guelt-es-Stel), 45 mins. being allowed in one direction and 33 mins. on the journey down the valley. In addition to the one through train, there is one in each direction daily between Blida and Boghari, 75 miles, and one between Blida and Medea, 31 miles, so that stations between Blida and Medea have three trains daily.

On some of the branches of the State Railway there is but one train, and that on but three days a week.

Some remarks on the Algiers stations and the train services thereto and therefrom are of interest.

trains. There is also displayed a card at the entrance to the platform giving the arrival and departure times of all trains, which are designated by numbers. The seven State Railway trains leaving Algiers are as follows :—

No. 11. 1st, 2nd, 3rd. 6.27, all stations to Menerville (35 miles).

No. 1. 1st, 2nd, 3rd. 7.26 to Constantine (290 miles).

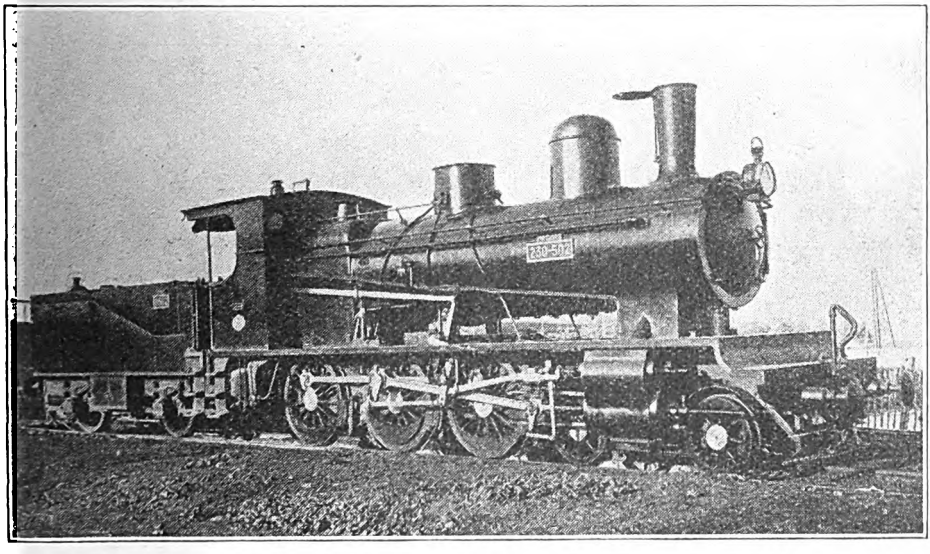
No. 17. 3rd. 9.1, all stations to Menerville.

No. 13. 1st, 2nd, 3rd mixed. 12.1, all stations to Beni-Bouira (107 miles).

No. 15. 1st, 2nd, 3rd mixed. 18.12, all stations to Menerville.

No. 3. 1st, 2nd, 3rd. 20.18 to Constantine.

No. 5. 1st, 2nd, 3rd mixed. 21.10 all stations



4-6-0 NARROW GAUGE LOCOMOTIVE, ALGERIAN STATE RAILWAYS.

The terminus is situate on the quay adjoining the passenger steamship berths, and has an arrival platform, with booking and other offices on the land side of it. The chief offices are devoted to baggage and *grande* and *petit vetisse*, the booking office being quite small. There is a bench running partly around the sides of the booking office, and by standing on this it is possible to read the lower parts of the time-tables, which are posted on the walls, about 6 ft. above the bench. Where the time-tables are posted on the walls without a bench it is impossible to decipher them. Probably this (in effect) absence of time-tables does not affect usual travellers, who presumably know the times of the

to Kroubs (280 miles), and then Sidi-Mabrouk (289 miles) and Constantine.

No. 1 is fast to Menerville calling only at Agha (an Algiers local station) and Maison-Carrée. With these two stops it occupies 92 mins. in running the 35 miles. Between Menerville and Constantine it stops at all the intermediate stations, 37 in number, and occupies 10 hrs. 41 mins. in covering 255 miles. A restaurant car—provided by the International Sleeping Car Company—is run in this train, whilst a sleeping car (*wagon-lits*) is run in No. 3 train, which occupies the same time as No. 1 to Menerville, but only stops at 23 intermediate stations, thence to Constantine, but despite the 14 fewer stops 10 hrs.

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31 mins. are occupied in running the 255 miles.

There are only six trains of the State Railway arriving at Algiers. They are as follows :—

7.44. No. 6. 1st, 2nd, 3rd mixed, from Constantine. Departs 14.25.
8.28. No. 4. 1st, 2nd, 3rd, with *wagon-lits* from Constantine. Departs 20.22.
9.55. No. 12. 1st, 2nd, 3rd mixed. Departs Menerville 8.10.
16.18. No. 14. 1st, 2nd, 3rd mixed. Departs Beni-Mancour 10.17.
19.55. No. 16. 1st, 2nd, 3rd mixed. Departs Menerville 18.17.
20.40. No. 2. 1st, 2nd, 3rd, with restaurant car. Departs Constantine 8.36.

The P.L.M. train service comprises six trains from and seven to Algiers, making a total for the two systems of 13 in each direction. The P.L.M. trains leave Algiers as follows :—

6.8. No. 21. Omnibus, 1st, 2nd, 3rd, all stations (except Ateliers—Abattoir station) to El-Affroum (43 miles).
7.51. No. 1. Express 1st, 2nd, 3rd, fast to El-Affroun and thence all stations to Oran (264 miles).
10.0. No. 23. 1st, 2nd, 3rd mixed, all stations but Ateliers and Sidi-Aid to Orleansville (131 miles).
12.50. No. 25. Omnibus 1st, 2nd, 3rd, all stations to El-Affroun.
17.27. No. 27. Omnibus, 1st, 2nd, 3rd, all stations to Affreville (75 miles).
21.0. No. 3. Express 1st, 2nd, 3rd, express to Oran.

No. 1 omits seven stations of the 10 between Algiers and Blida, and the two between Blida and El-Affroun. A restaurant car runs in this train. 10 hrs. 26 mins. are required for the journey of 264 miles. The speed of No. 23 averages less than 15 miles an hour; 9 hrs. 8 mins. being spent on the journey of 131 miles.

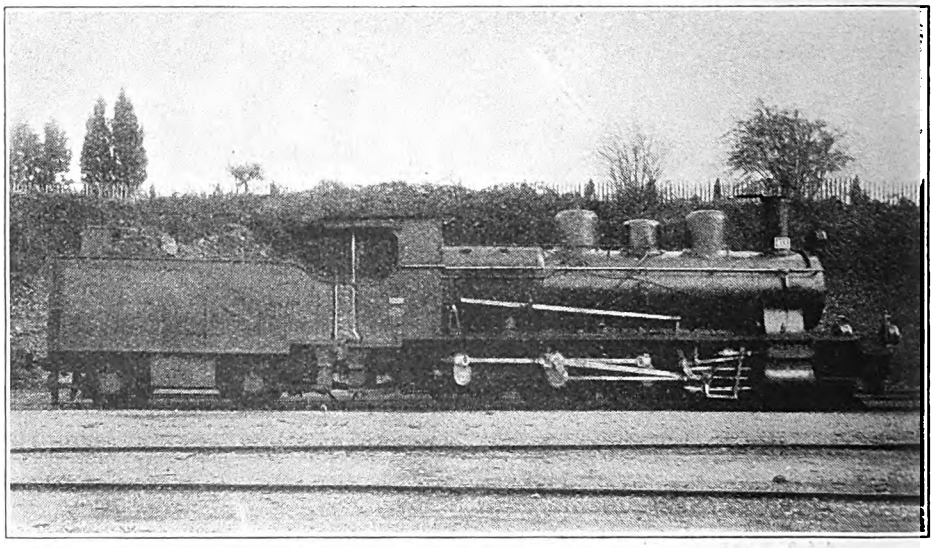
No. 3 has both a sleeping car (*voiture-lit*) of the International Sleeping Company and a P.L.M. *lits-salon*; to travel in either of which a supplementary payment beyond the first-class fare is necessary. In the *voiture-lit* the addition is 29 fr. 70 c.

The P.L.M. trains arrive at Algiers as below :—

6.53. No. 4. 1st, 2nd, 3rd, express from Oran, which is left at 21.24.
7.59. No. 28. 1st, 2nd, 3rd, omnibus, all stations from El-Affroun. Departs 5.27.
10.41. No. 30. 1st, 2nd, 3rd, omnibus, all stations from Affreville. Departs 6.12.
13.58. No. 26. 1st, 2nd, 3rd, omnibus, all stations from Orleansville. Departs 4.51.
18.9. No. 32. 1st, 2nd, 3rd, omnibus, all stations from El-Affroun. Departs 15.39.
19.2. No. 2. 1st, 2nd, 3rd, express from Oran. Departs 8.28.
21.44. No. 34. 1st, 2nd, 3rd, omnibus from El-Affroun. Departs 19.17.

No. 4 has sleeping car and *lit-salon* accommodation, and omits calls at 31 stations. No. 2 is provided with a restaurant car, and is not booked to stop at 16 of the 50 intermediate stations between Oran and Algiers.

The number of types of locomotives,



4-6-0 NARROW GAUGE LOCOMOTIVE, P.L.M. RAILWAY.

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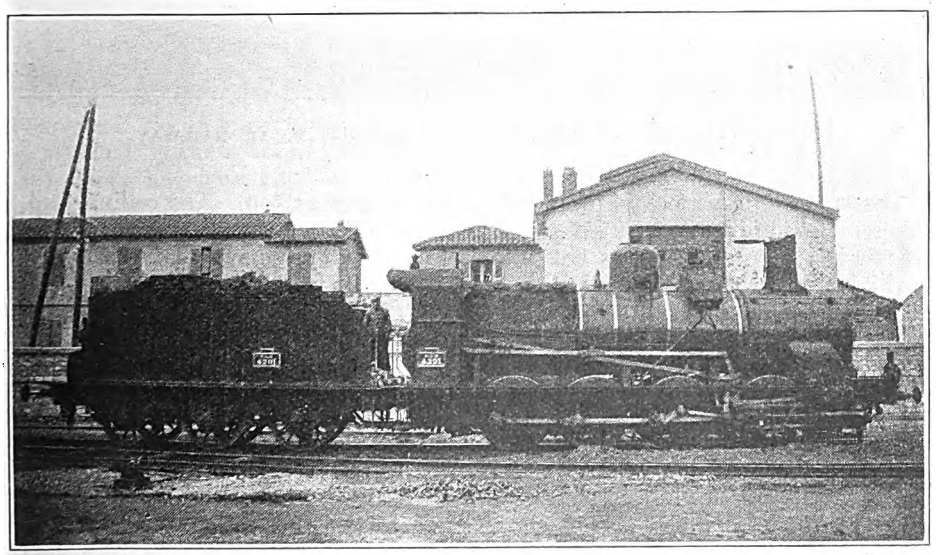
compared with the total number of engines in Algiers, is large. The P.L.M. has more numerous specimens, although its total, particularly of the standard gauge, is less than that of the State Railway. Several of the P.L.M. locomotives are fitted with a speed recorder, the timepiece of which is placed on the running board at the side. It is somewhat curious to see a clock in this position. A plate giving the driver's name is placed in a frame on the outside of the engine cab, a plan adopted by the late Midland Railway during the past 12 years.

Many P.L.M. locomotives are provided with four-wheel tenders; these weigh only 13 or 14 *tonnes*.* The weights of the engines also are moderate: the older 4-6-0 express engines (No. 3619 type) weigh 57 *tonnes*, whilst the curious 4-6-0 locomotives, with a steam drying chamber superimposed on the boiler, similar to No. 3051, illustrated on page 190, weigh only 49 *tonnes*. The more modern class of 4-6-0 weigh, however, 65 *tonnes* and the 6-wheel tenders, 19 *tonnes*. Coal briquettes are chiefly employed for locomotive fuel; and they can be frequently seen piled up on the engine tenders.

The P.L.M. goods locomotives have 8 coupled wheels. No. 4201 is of the 0-8-0 type, and weighs 50 *tonnes*. No. 4008, an older design of the 0-8-0 type, has all the axles under the boiler, the running board is raised over the two first axles to allow of easy access to the motion, &c. This type weighs 46 *tonnes* and its 4-wheel tender 13 *tonnes*.

The P.L.M. employs 3 types of engines on its narrow gauge lines in Algiers, of which two are tanks. The oldest, No. 1 class, have names, they are of 2-6-0 wheel arrangement and have long side tanks. The other type of narrow gauge tank engines have the 2-8-0 wheel arrangement, the leading wheels are of small diameter. The tender type has the 4-6-0 wheel arrangement, the tender is carried on 4 wheels.



0-8-0 LOCOMOTIVE, P.L.M. RAILWAY.

Of locomotives on the Algerian State Railway system three types are in use, of which two are for the normal gauge. All types are superheated. Of the standard gauge types, one is for freight traffic, and has the 2-10-0 wheel arrangement, a 6-wheel tender is employed.

Another is a mixed traffic engine, 4-6-0 wheel arrangement, and bogie tender; a cowcatcher is fitted. The narrow (1·055 metre) gauge locomotive stock is represented by a 4-6-0 class to which a platform or cowcatcher is fitted; the tender is of the 4-wheel type.

* *Tonne* = 0·9842 English ton or 2,204½ lb.

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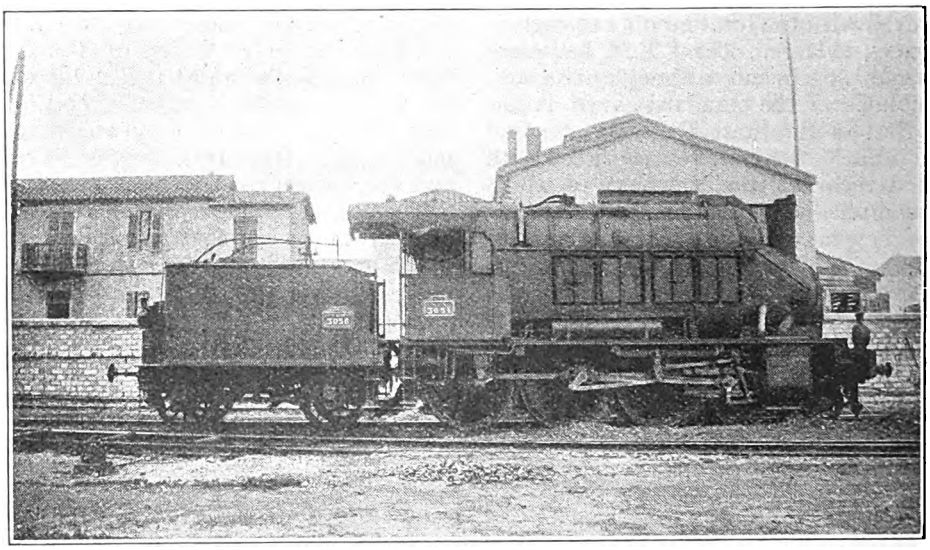

4-6-0 LOCOMOTIVE, WITH SPECIAL BOILER, P.L.M. RAILWAY.

The passenger rolling-stock of the P.L.M. Algiers section affords as many varieties as are to be found on the parent line. Some third-class modern coaches are four-wheel vehicles weighing 14 *tonnes*. They have wooden seats, their whole length, one on each side and double one (back to back) down the centre. There is a door in the centre, and a platform at each end, on which the natives appear to prefer to travel. They even sit on the floor of the platform with their feet resting on the footboard. Apparently they also like to travel on the couplings and other connections between the carriages, as there appears on the ends of these carriages in French and Arabic: "It is expressly forbidden to ride between the carriages." These coaches are of teak, and lighted by gas, which is stored in a cylinder above the roof. Another type of third-class coach, carried on six wheels, has seven compartments with a side corridor, but no doors separating the corridor from the compartments. There is a lavatory compartment in the centre, and at one end outside is a brake compartment, gas is stored in a cylinder on top; the weight is 18 *tonnes*. These coaches are painted green.

A type of second-class coach has a side corridor with lavatory, five compartments, each seating four a side. The compartments are lofty, well upholstered, steam heated and gas lighted. The quarter lights open at top. The ceiling and sides above the upholstery are papered with a spot design common in English first-class coaches 45 years ago.

The *lits-salons* are carried on six wheels, the exteriors are purple brown below waist and black above. They have three compartments and a coupé (providing in all seven beds) and two lavatories; they weigh 17 *tonnes*.

The goods vehicles are of many kinds. We saw some new iron bogie hopper mineral wagons to carry 40 *tonnes* fitted with air brake and steam heating pipes. The tare of the wagons was 18,850 kilos (18½ tons). There were private traders' wagons, owned by the Société L'Ouenza. We also observed some petrol tank wagons fitted at end with a guard's box above the roof; these belonged to the *Société Italio-Americaine pour le pétrole*. Apart from these two types of private wagons, goods vehicles appeared to be owned by the railways.

The State Railway, in addition to the lines serving Algiers district, which lines extend into Constantine department, has a separate system of lines centred on Oran, unconnected with its Algiers and Constantine lines. The main line of the State system in Oran extends from the port of Oran to Colomb-Bechar, 467 miles. On three days a week there is a through train in each direction, but all sections of the

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line have at least one train daily in each direction, but useless for through passengers; thus the three-days-a-week through train runs daily between Oran and Saida, 131 miles, arriving at 0.38. A train leaves Saida at 7.50 for Ain-Sefra, 181 miles, arriving at 18.57, but the train for Columb-Bechar leaves Ain-Sefra at 6.4 and runs only on the four days of the week that the through train does not run. The journey of 467 miles by the through train from Oran to Columb-Bechar occupies 22 hrs. 24 mins., and is first, second and third class, and mixed.

Around Algiers there is a system of steam tramways (Chemins de fer sur routes d'Algérie), which mostly run alongside the roads, but at places have an independent route across country, and frequently their own bridges across rivers and streams. Second and third class only are conveyed by these trams, and several do not carry luggage. The longest length of line is from Algiers to Kolea, 29½ miles. The quickest tram takes 2 hrs. 11 mins. to cover the distance. The vehicles have centre buffers and side-screw couplings, and (both goods and passenger) are fitted with the air brake.

The *Universal Directory of Railway Officials for* 1923 gives the following particulars of rolling-stock in Algiers:—

State Railway.—Algiers division: standard gauge—133 locomotives, 169 carriages, 2,127 wagons; metre gauge—31 locomotives, 38 carriages, 314 wagons. Oran division: 1·05 metre gauge—107 locomotives, 128 carriages, 1,555 wagons. Bône division: standard gauge—94 locomotives, 86 carriages, 666 wagons; metre gauge—34 locomotives, 22 carriages, 505 wagons.

P.L.M. Railway.—Standard gauge—56 locomotives, 153 carriages, 1,264 wagons; 1·05-metre gauge—28 locomotives, 39 carriages, 302 wagons.

The C.F.R.A. (road railways) has 49 locomotives, 69 carriages and 441 wagons, in addition to electric motors, tramcars, and road motors.

FRENCH STATE (OUEST) RAILWAYS.

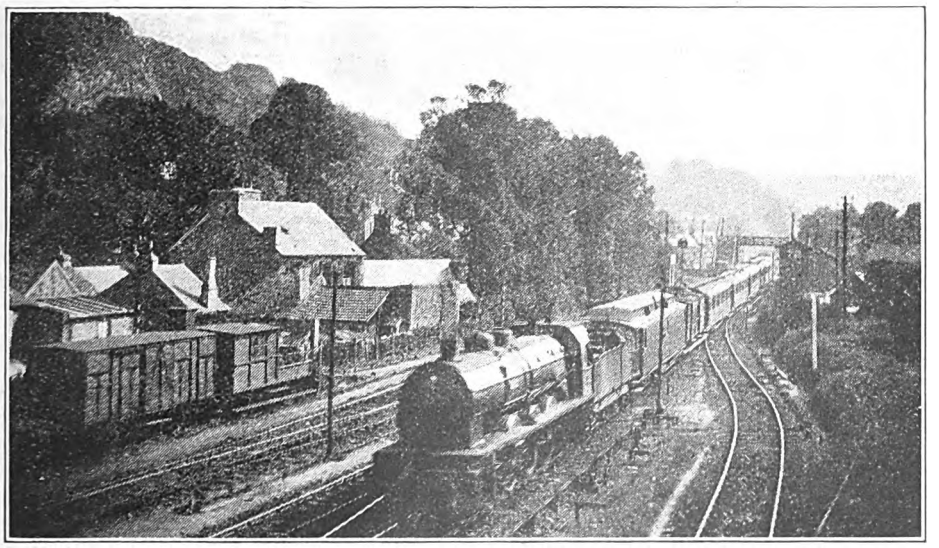

Photo.] PARIS-CHERBOURG EXPRESS APPROACHING CHERBOURG. [*B. D. Sullock.*

4-6-2 locomotive No. 231·505.

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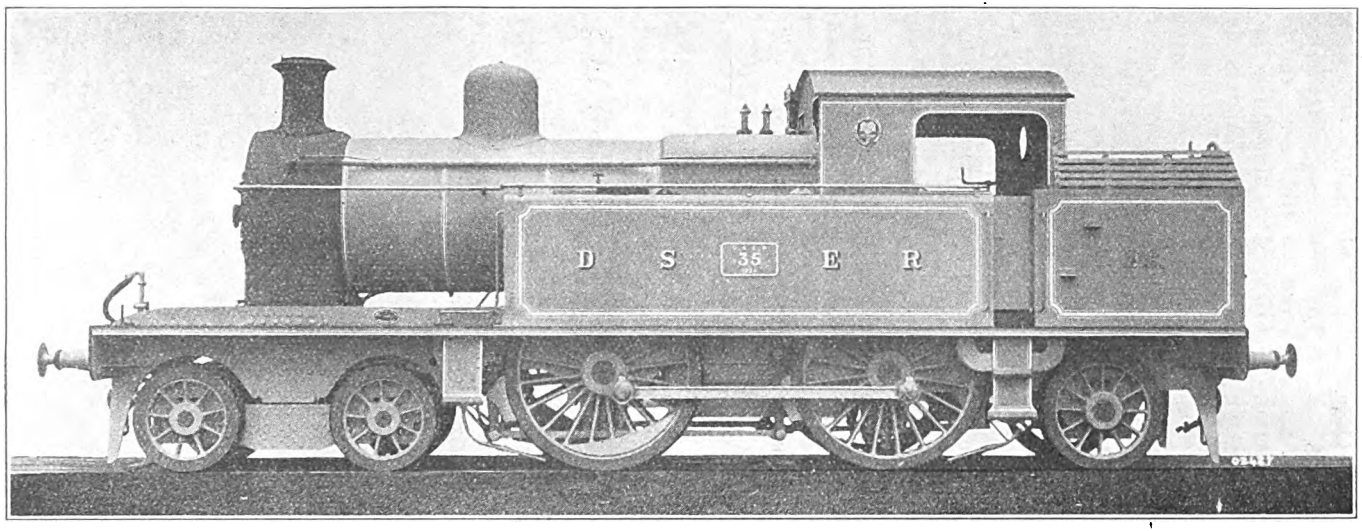
NEW TANK LOCOMOTIVE, GREAT SOUTHERN RAILWAYS, IRELAND.



WE are indebted to Mr. George H. Wild for a photograph of a new 4-4-2 type tank engine, which, as Locomotive Engineer of the Dublin & South Eastern Railway, he designed for working suburban train service on that line, now merged in the Great Southern Railways of Ireland, of which Mr. J. R. Bazin is Chief Mechanical Engineer. In addition to being especially adapted for working suburban trains between Amiens Street and Greystones, the engines are designed for working on the sharp curves at Dun Laoghaire Pier. The builders were Messrs. Beyer, Peacock & Co. Ltd., of Manchester.

Leading particulars are: Cylinders, 18 in. by 26 in.; coupled wheels, 6 ft. 1 in.; steam pressure, 175 lb. per square inch; heating surface, 1,193 square feet; grate area, 20 sq. ft.; weight in working order, 63 tons.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

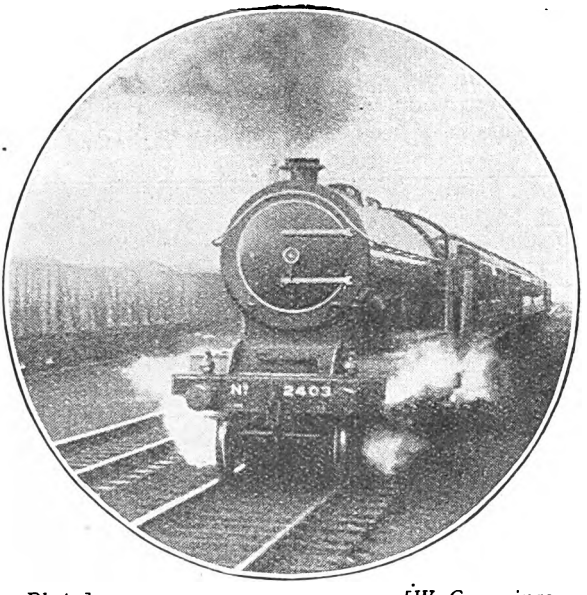

Photo.] [*W. Cummings.*

EAST COAST SCOTCH EXPRESS PASSING BERWICK SIDINGS.

N.E. 4-6-2 locomotive No. 2403.

A LETTER has reached me from a Huddersfield correspondent which deserves attention in these columns. Writing in regard to my footplate journey on the "Cornish Riviera Limited" express of the Great Western Railway, which was described at length in the issue of last December, he says: "I find a noteworthy contrast between your trip on *Pendennis Castle* and the footplate journey on the 'Pacific' engine of the London and North Eastern Railway described in your article of July, 1923. On the former run the theoretical conditions for maximum efficiency—steam pressure immediately below blowing-off point and as early a cut-off as possible—appear to have been in evidence. On the latter, however, steam pressure was allowed to vary, and a late cut-off was used.

"To be more precise, we may compare the Doncaster–London stretch with the Paddington–Exeter portion of the Great Western run, the former being probably the harder road, although the steepest gradients are to be found on the latter." This is very likely the case, owing to the greater length of the Great Northern grades of a steepness of 1 in 200 and upwards continuously, although the vertical rise figure from King's Cross to Doncaster is practically the same as that from Paddington to Exeter *via* Westbury. "On *Pendennis Castle*," the letter continues, "the cut-off was never advanced beyond 35 per cent., while on No. 1473 it was never brought earlier than 45 per cent., except for one easy length where 40 per cent. was used. Do you think that the more efficient method *could* not have been employed with the 4-6-2, or that the driver was merely following his personal preference? If the former were the case, it would have to be admitted that the Doncaster engine is inferior in design to the Swindon machine."

Such a question as this, in a day when the two types concerned stand out as unquestionably the most advanced expressions of express locomotive design that the country has produced, is one of very intriguing interest. As to whether the Great Northern "Pacifics" can be driven with a wide-open regulator and an early cut-off, I am unable definitely to say, but I do not fancy that it is a regular practice, at any rate. This brings us to the old question of the "traditional" in locomotive driving, which is a very vital factor in its influence upon method. The Great Western locomotive authorities, ever since the advent to power of Mr. Churchward

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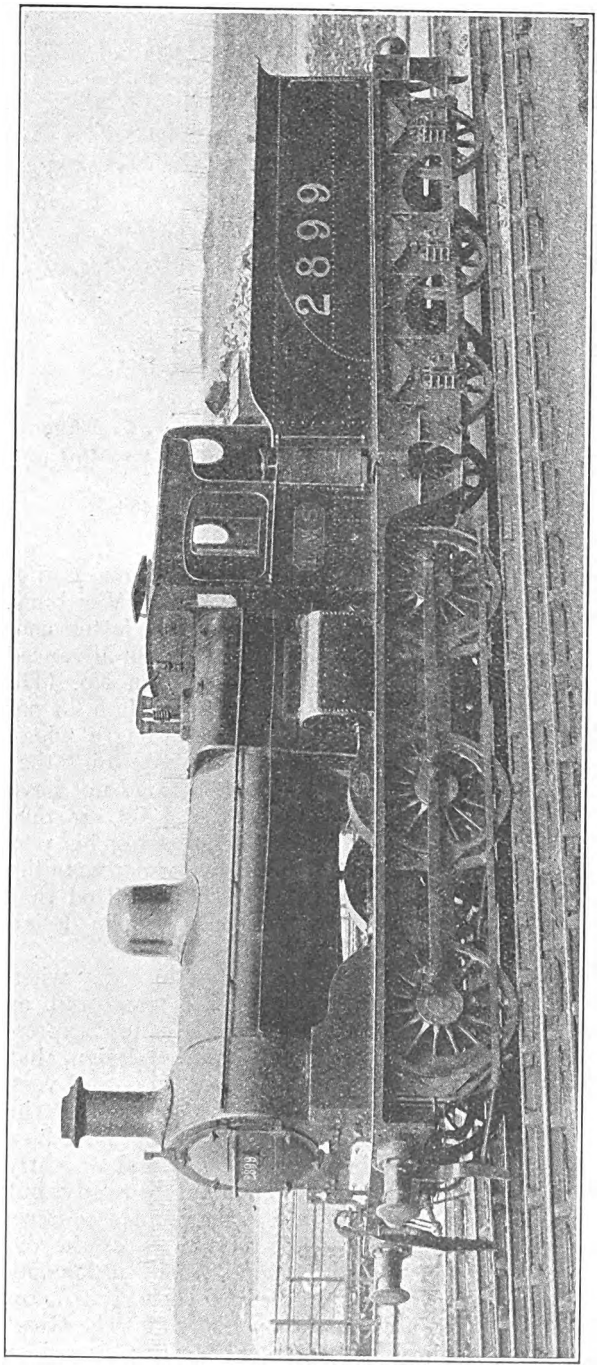
at Swindon, have been turning out locomotives capable of being driven with full regulator and cut-offs of 20 per cent. or less, even on exacting express duties. Drivers have been encouraged so to drive; firemen, on themselves taking over command on the footplate, have followed the practice of the drivers under whom they have served; and the method has thus become more or less traditional on the G.W.R. But I would not say universal, by any means. There are Great Western drivers who, to quote my friend's remark, follow "their own personal preference" in their methods, with more restricted regulator openings and a later cut-off.



REBUILT 0-6-0 LOCOMOTIVE, L.M.S.R.

These engines were originally designed and built for service in Turkey, and are now employed on the Tilbury Section, Midland Division, L.M.S.R.

On the late Great Northern Railway, on the other hand, the training has been distinctly of the opposite order. The sharp blast of the "Atlantics" makes it undesirable for them to be worked for lengthy periods with the regulator wide open, and their comparatively small cylinders—especially in the matter of a stroke of only 24 in.—do not favour the maintenance of an exceptionally early cut-off. As these "Atlantics" were the standard type of engine on the Great Northern for some twenty years, it is easy to understand how traditional methods of driving have come into force in this case also. When I made my journey on No. 1473, the "Pacifics"—other than the two pioneer engines, Nos. 1470 and 1471—were but newly in use, and it was not surprising, in these circumstances, to find a driver employing the methods of driving to which he had accustomed himself on "Atlantics." It may be that "Pacific" drivers, as by degrees they have accustomed themselves to the possibilities latent in their new charges, have now somewhat modified their driving practice; whether

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this be so or not, I hope ere long to be able to verify from personal observation.

Much the same comments may be applied to the matter of working steam pressure. It is not every Great Western express crew that makes use of the full 225 lb. per square inch to which the boilers are pressed. Several drivers that I know are quite content to work at round about 180 lb., except on the hardest duties, when the use of the full 225 lb. becomes more or less imperative. Similar "personal preference" doubtless operated on my journey on No. 1473. It certainly was not that the fireman was *unable* to maintain the pressure at 180 lb.; on the contrary, he raised it without difficulty from 140 to 180 lb. during a quarter of an hour when the engine was putting out one of the biggest efforts of the whole journey. It was simply that the full 180-lb. pressure was not deemed to be necessary, the following of "Atlantic" driving methods with the "Pacific" being more than adequate to maintain time. As I have already said, experience with the "Pacifics" may now be dictating different methods; that I am waiting to see.

But let me say, in conclusion of this brief argument, that theoretical efficiency —which is, for all intents and purposes, *thermal* efficiency— is not the only ideal to keep in view in locomotive design and performance. Low coal consumption in proportion to work performed is a most desirable aim, and a definite source of economy; but costs of maintenance must also be kept in view. I believe I am right in saying that the engine which is habitually driven at a very early cut-off is likely to visit the shops sooner, for attention to the motion, than the engine whose driver adopts a later cut-off as his general practice. It seems reasonable to suppose, also, that the engine whose boiler and steam passages are being strained without intermission by an internal pressure of 225 lb. is likely to require the replacement of those parts sooner than the locomotive which is pressed to 180 lb., and perhaps works for a large part of its time at 150 lb. or so. Thus it is possible for economy in one direction to lead to extravagance in another. In judging, therefore, which of two locomotive types is "inferior in design" to the other, one has to take into account various important considerations other than mere thermal efficiency alone, in arriving at a true estimate. Sufficient evidence is not yet available to allow of such an arbitration between the claims of the Gresley "Pacifics" and the Collett "Castles"; on the basis of actual work performed, my experiences hitherto have been such as to offer little or no distinction in the performance of the two types, either uphill, downhill, or on the level.

Here I must call a halt in regard to "Practice," in order that space may be left in which to review once again the remarkable performances which are being put up by the Great Northern "Pacifics." I had intended—as foreshadowed last month—to deal with their work over the North Eastern and North British sections of the L.N.E.R., but as the best work that they perform, taking a general average, is undoubtedly when they are in the hands of Great Northern drivers, I will give precedence to their running over Great Northern metals. With the "Pacific" runs I will include some also behind "Atlantics," of whose running I have recorded some extraordinarily fine samples during recent months. We will therefore start, in the first table, with runs northwards from King's Cross, commencing with four "Atlantic" journeys, and following on, where the "Atlantic" loads leave off, with some of the colossal "Pacific" loadings of to-day.

The run of No. 4417, in the first column, commended itself chiefly in virtue of a fast start and a wonderful finish. We were doing the exceptional speeds of 60 m.p.h. at Wood Green and 50 at New Barnet, while the minimum at Potter's Bar was 48 and the maximum at Hatfield 70½ m.p.h. Then, after Peterborough, we reached 65 m.p.h. at Helpston, and accelerated thereafter, up an unbroken rise varying from 1 in 560 up to 300, with short intervening level strips, to 68 between Tallington and Essendine—a very remarkable figure. At Bytham we were still doing 60; the 1 in 200 up to Corby brought us down to 50, with an increase to 53½ on the short level through that station, while we fell to 48 at Stoke Summit. Thus, with the easiest running from Hatfield to Peterborough and Stoke into Grantham, we arrived 3 min. 20 sec. early (the train was the 5.30 p.m. down),

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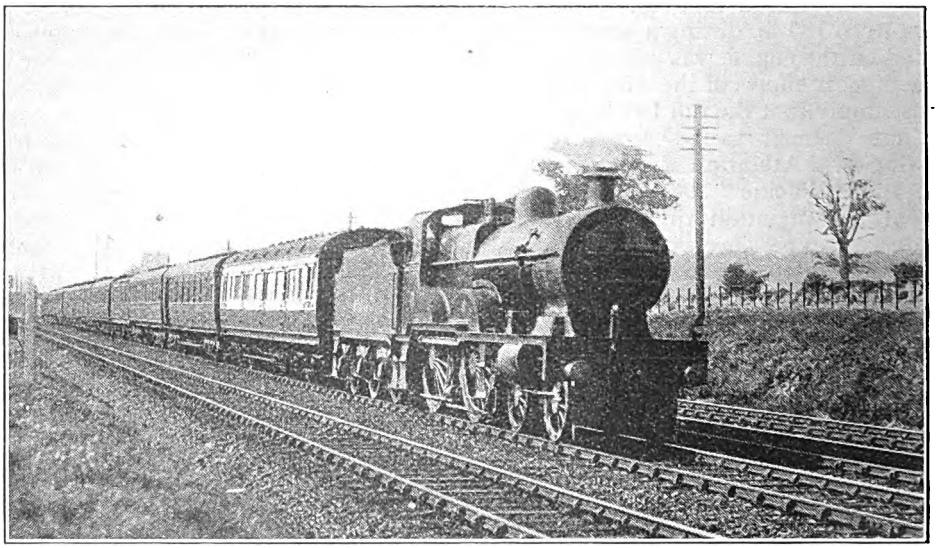
in 113 min. 40 sec. from King's Cross, by far the finest achievement, of course, being a time of 32¼ min. from Peterborough to Grantham.

The effort of No. 273, in the second column, was simply amazing, and bade fair to beat even what No. 4417 had done, at almost every point, but for the delays. The first of these—from our old friend the 5.7 p.m. from Broad Street to Potter's Bar, of course—was, however, a piece of real good fortune, as it led the driver to give an exhibition of speed closely comparable to that of No. 1427, on the same train some sixteen years previously, when after a similar check we ran the 59·9 miles from Potter's Bar to Yaxley in 52 min. On this occasion the time was only 53 min. 50 sec., and that after passing Potter's Bar much more slowly than usual, as we had been almost stopped at Greenwood Box, just south of Hadley Wood. We had made a considerably better start to Finsbury Park than on No. 4417's run, and were doing 58½ an hour at Wood Green and 48 at New Barnet, when the check came, and cost us, as nearly as I can estimate, 4¾ min. After that we went like the wind. At Hatfield the top speed was 74 an hour, and after falling to 55 at Woolmer Green, we passed Hitchin at 77½, touched 83½ at Three Counties, fell to 74 beyond Arlesey, touched 77½ again between Biggleswade and Sandy, and passed Sandy at 75 and Tempsford at 72½, after which the minimum at St. Neot's was 65 and the maximum at Offord 74 m.p.h.

The engine was allowed to fall to 50½ an hour up Stukeley bank, but down Ripton bank we got up to 77½ m.p.h. yet again, and maintained 64 up the short rise to Yaxley, after which there was a slight increase to 65 before steam was shut off for Peterborough. Net time from King's Cross to Peterborough, with all but 300 tons, was 76 min., a fine feat indeed for an "Atlantic." Our average speed over the 54·9 miles from Hatfield to Yaxley was 67·1 m.p.h.; the 30·3 miles from Stevenage to Huntingdon gave an average of 72·4 m.p.h.; and the 12·2 miles from Hitchin to Sandy one of 77·0 m.p.h. After Peterborough, when we had attained 64 m.p.h. at Tallington, there came the cruel series of checks from the 4.15 down, ahead of us, but even so our arrival was only 70 sec. late, and our net running time was certainly less than 110 min., probably a shade over 109 min. The fastest section times from these two runs alone, if added together, give the noteworthy figure of 107¾ min. from King's Cross to Grantham, or 9¼ min. under schedule.



L.M.S.R. (L.N.W. SECTION) UP MANCHESTER AND EAST LANCASHIRE EXPRESS.

Hauled by new Midland Section compound 4–4–0 locomotive No. 1055.

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No. 1444, again, ran very well, and with no very high downhill speeds. Minima were 46 m.p.h. at Potter's Bar and 55 at Woolmer Green, but we had attained 72½ before Hitchin, when we were brought down to 60 by adverse signals, and so only reached 71½ at Arlesley. A minimum of 53½ m.p.h. at Leys Summit was flanked by maxima of 71½ at Offord and 74 at Holme respectively, and we ran through Peterborough in 80 min. 50 sec., or about 30 min. net. Then the 4.15 delayed us once again, bringing our speed down to 40 m.p.h. at Little Bytham, after we had touched 62½ at Tallington; but we recovered magnificently, accelerating to 50 m.p.h. above Corby and only falling to 48 at Stoke. Thus, with a maximum rate of 71½ an hour below Ponton, we were ¾-min. early, despite both checks; net time did not exceed 113½ min. at most.

Then follows a run behind No. 4430, in the fourth column, on the 1.15 p.m. down, allowed 122 min. to Grantham. This is usually a "Pacific" turn, the engine working through to York, but on this occasion an "Atlantic" had to tackle the train, composed of the latest Scotch stock, whose heavy consumption of electricity (for cooking as well as lighting) is likely, in my judgment, appreciably to increase the frictional resistance required to be overcome by the engines, in proportion to the actual weight of the stock, which itself is very heavy. But No. 4430 did quite well, after a fairly leisurely start. We touched 72½ m.p.h. at Hatfield, fell to 53 at Woolmer Green, and were doing 76½ below Stevenage when brought down to 40 for p.w. repairs at Hitchin. But we were doing 68 again at Biggleswade, 70½ at Sandy, and 71½ at Tempsford; we only fell to 60 at St. Neot's and touched 71½ at Offord; while, after a minimum of 48½ at Leys Box, we did 76½ down Ripton bank. The running beyond Peterborough was also quite good, with a speed of 57½ m.p.h. beyond Tallington and a minimum rate of 43½ an hour at Stoke. So we gained just over a minute to Grantham, making the run in a net time of about 119 min.

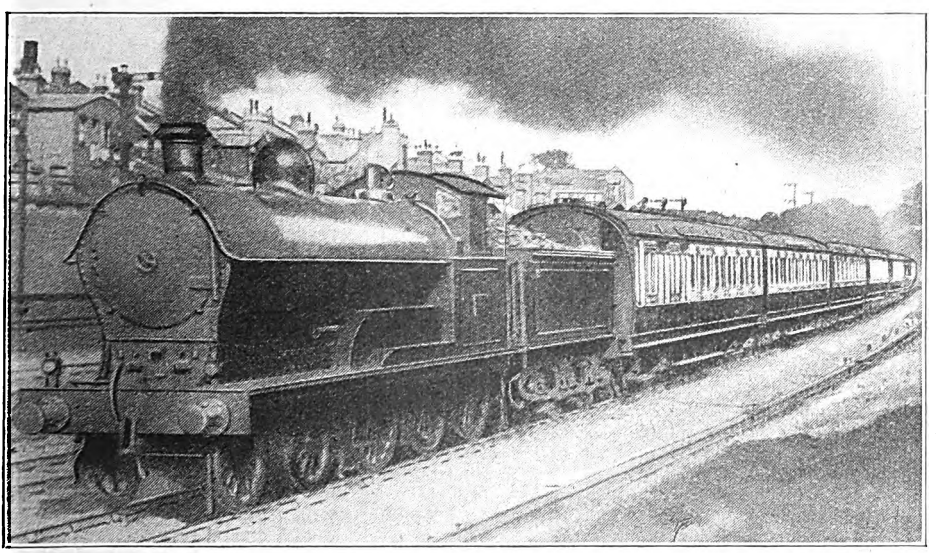

Photo.] [*F. E. Mackay.*

BIRMINGHAM AND WOLVERHAMPTON EXPRESS, NEAR WILLESDEN JUNCTION.

L. & N.W. Section 4-6-0 locomotive "Enchantress."

We now come to the "Pacific" journeys. That of No. 1479 was on the 10 a.m. down "Scotsman," also with the new Scotch stock. In the early stages we slipped somewhat, on the way through the tunnels, and possibly for the same reason our speed dropped from 46½ an hour at New Barnet (after 54 at Wood Green) to but a shade over 40 at Potter's

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Bar. We touched 72½ m.p.h. at Hatfield, and then came the bad signal check at Welwyn. This spurred the driver, however, to a fine speed effort below Hitchin, whereby we touched 83½ an hour at Three Counties, only fell to 75 after Arlesley, and were doing 77½ at Biggleswade, 72½ at Sandy, and 75 sustained at Tempsford. But after this the engine was eased, and we fell to 65 at St. Neot's, and did not exceed 70½ m.p.h. at Offord. Now followed the very serious slowing over the diversion works at Huntingdon, prolonged for over a full mile, and felt in its effects as far as Abbot's Ripton; after that we touched 74 an hour at Holme. From Peterborough to Essendine we did nothing remarkable, but magnificent work was done from there to Stoke, with a sustained rate of 50 m.p.h. up the 1 in 200 to Corby, and then, after a maximum of 55½ just beyond that station, a minimum of no less than 51 an hour up the 3 miles at 1 in 178 to Stoke. This was a good

L.N.E.R. KING'S CROSS—GRANTHAM.

Distance.	Engine Type.	4-4-2.				4-6-2.				
	Engine No. ..	4417	273	1444	4430	1479	2546	4472	1479	1478
	Load (axles) ..	38	40	44	40§	40§	—	58	59	66
	,, (tons tare)	264	275	306	334	343	385	417	424	482
	,, (,, full)	280	290	325	360	360	410	440	445	510
Miles.		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0.0	King's Cross ..	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
2.5	Finsbury Park ..	6 45	6 05	6 25	7 40	6 55	6 38	7 05	6 45	8 45
5.0	Wood Green ..	9 45	9 05	9 35	11 10	10 00	—	10 20	9 55	12 05
			sig. stop					p.w.r.		
12.7	Potter's Bar ..	19 00	22 45	20 00	22 20	20 15	20 31	20 45	19 40	22 25
17.7	Hatfield ..	23 55	28 10	25 00	27 45	25 25	25 44	25 45	24 35	27 50
						sigs.		p.w.r.	sigs.	
25.0	Knebworth ..	31 45	35 20	32 05	35 05	34 15	—	34 30	31 55	35 30
28.6	Stevenage ..	35 30	38 40	35 25	38 30	37 45	*35 59	37 55	35 20	39 10
				sigs.			p.w.r.	p.w.r.		
31.9	Hitchin	38 35	41 30	38 35	41 25	40 45	38 58	41 40	38 15	42 20
					p.w.r.					
37.0	Arlesey	42 45	45 20	43 15	47 15	44 35	43 59	47 30	42 15	46 35
44.1	Sandy	49 00	51 00	49 35	53 50	50 15	49 46	54 10	48 10	52 50
51.7	St. Neot's ..	56 25	57 35	56 55	60 45	56 50	56 08	61 25	55 25	60 05
						p.w.r.				
58.9	Huntingdon ..	63 30	63 45	63 30	67 20	64 15	62 04	68 05	62 15	66 55
62.0	Leys Box ..	67 15	67 05	66 40	70 50	70 30	65 01	71 25	65 50	70 35
69.4	Holme	74 10	73 45	73 20	77 45	77 20	—	78 15	72 50	77 35
72.6	Yaxley	77 05	76 35	76 20	80 40	80 20	—	81 20	75 45	80 30
								sigs.	sigs.	sigs.
76.4	Peterborough¶ ..	81 25	80 45	80 50	85 00	85 05	78 38	86 45	80 50	85 55
79.5	Werrington Jc...	86 20	85 55	85 55	90 30	90 35	—	6 15	6 05	6 45
			sigs.					sigs.		
88.6	Essendine ..	94 45	95 00	95 00	100 20	100 00	14 20	16 00	15 55	16 55
			sigs.	sigs.						
92.2	Little Bytham ..	98 15	99 15	99 05	104 15	103 50	17 55	19 45	19 55	21 05
			sigs.							
97.1	Corby	103 45	107 55	106 50	110 30	109 30	†23 16	25 10	25 55	27 45
100.1	Stoke Box ..	107 25	112 10	110 35	114 30	112 55	26 48	28 35	29 45	31 55
					sigs.			sigs.		
105.5	Grantham ..	113 40	118 10	116 15	120 50	118 50	32 32	34 50	35 25	38 35
105.5	Net times (min.)	113¾	109½	113½	119	113¼	77+32½	81¾+34	80+35½	85½ +38½
105.5	‡Non-stop times (min.)	113¾	109½	113½	119	113¼	—	114	113¾	122

* 28½ mile-post. † 97 mile-post. ‡ Net equivalent non-stop times.
§ New Scotch stock. ¶ Severe service slack.

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illustration of the perfect ease with which the "Pacifics" haul such trains as the "Scotsman," with a handsome margin of time in hand against delays.

The run of No. 2546, recorded by a friend who at one time was responsible for the writing of these articles, was an astonishing effort on the 10.10 a.m. down Leeds. The start to Hatfield was not exceptional, but after some fast running from Hatfield to Stevenage (wherein the 24 mile-post, at Woolmer Green Summit, was passed in 31 min. 49 sec.), and the Hitchin p.w.r. slowing, costing 1½ min., some striking work was done, all the times onwards from Sandy to Peterborough being the fastest in the table. The last mile up to Leys Summit was run at an average rate of 59 m.p.h., and the 75 mile-post was passed in 76 min. 29 sec., or 75 min. net, the 38 miles from Arlesey having, in fact, been run in 32½ min. exactly, at an average of 70·1 m.p.h. Then, after waiting the loop connection at Peterborough, which cost a halt of 8½ min., a perfectly astounding run—with this 410-ton train—was made to Grantham in 32 min. 32 sec., start to stop; mile-post

L.N.E.R. GRANTHAM—KING'S CROSS.

Schedule.	Engine Type.	4-4-2.				4-4-2.‖	4-6-2.		
	Engine No. ..	4436	4426	1431	1444	3300	1475	1474	2546
	Load (axles)	36	40	42	46§	58	48	40§	46§
	„ (tons tare)	271	280	312	380	397	323	343	375
	„ („ full)	285	295	330	410	420	340	365	400
		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	Grantham ..	0 00	—	0 00	0 00	0 00	0 00	0 00	0 00
3·5	Ponton ..	7 20	—	7 25	8 35	7 05	7 20	7 30	7 15
5·4	Stoke.. ..	10 15	—	10 10	12 05	9 50	10 05	10 25	10 00
8·4	Corby ..	13 30	—	13 25	15 35	13 05	13 05	13 35	13 10
				p.w.r.					
16·9	Essendine ..	20 20	—	20 50	22 35	20 00	19 55	20 10	19 45
26·0	Werrington Jc.	28 40	—	30 30	30 10	27 20	27 25	27 35	27 05
						sigs.		sigs.	
29·1	Peterborough¶	32 20	0 00	34 15	33 35	31 20	31 10	34 15	30 55
32·9	Yaxley ..	37 40	6 15	40 05	39 50	37 45	36 35	40 40	36 55
36·1	Holme ..	40 45	9 20	43 10	43 10	41 00	39 45	43 55	40 20
42·0	Abbot's Ripton ..	46 25	15 15	48 55	49 55	47 05	45 45	50 05	46 20
46·6	Huntingdon	50 55	20 05	53 35	55 15	51 50	50 30	54 55	51 00
53·8	St. Neot's ..	57 05	26 15	60 05	62 10	58 20	57 10	61 25	57 25
61·4	Sandy ..	64 10	33 00	67 30	69 55	65 00	65 05	68 45	64 25
68·5	Arlesey ..	70 50	39 45	75 00	77 25	71 30	73 15	76 20	71 20
						sigs.			
73·6	Hitchin ..	75 55	45 00	80 30	83 15	81 50	79 35	82 10	76 50
							p.w.r.		
76·9	Stevenage ..	79 50	49 05	84 40	88 05	86 35	84 15	87 05	81 00
80·5	Knebworth ..	83 50	53 05	88 45	92 35	90 40	89 10	91 40	84 50
				p.w.r.	sigs.			sigs.	
87·8	Hatfield ..	90 30	59 55	97 45	101 05	97 50	96 35	99 40	92 05
92·8	Potter's Bar	95 15	65 50	103 40	106 50	102 55	101 55	105 30	97 35
		p.w.r.	p.w.r.	p.w.r.				p.w.r.	sigs.
103·0	Finsbury Park	104 35	76 50	113 45	116 25	112 00	111 15	115 05	108 45
		sigs.	sigs.						sigs.
105·5	King's Cross..	109 45	81 55	117 40	120 25	116 00	115 15	119 00	113 00
105·5	Net times (min.) ..	108	*79	112	119	109½	114¾	114½	111

* Peterborough to King's Cross, 76·4 miles. ‖ Piloted by 4-4-0 No. 4332.
§ New Scotch stock. ¶ Severe service slack.

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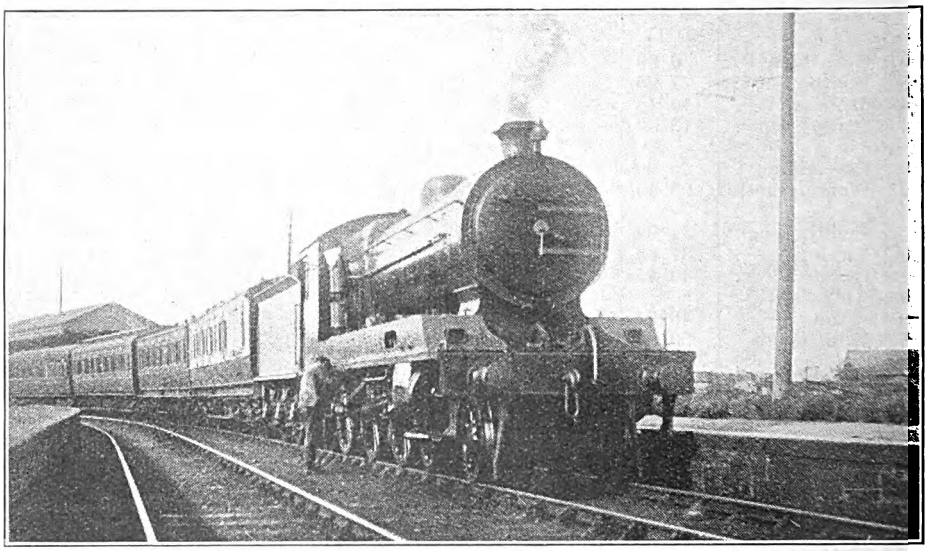
82, 5·6 miles, was passed in 8 min. 5 sec.; the next 3 miles to 85 were run in 2 min. 51 sec., 3·6 miles on to Essendine in 3 min. 24 sec., and the 3·6 miles thence to Bytham in 3 min. 35 sec.—total, 10·2 miles, almost exclusively uphill, in 9 min. 50 sec. The Bytham to Corby time also took the record, but No. 4472, in the next column, slightly beat that from Corby up to Stoke.

Again 8½ min. was spent at Grantham waiting a connection from the east, and then yet another brilliant effort followed, with times of 6 min. 16 sec. to Barkston (4·2 miles), 14 min. 45 sec. to Newark, 14·6 miles; 19 min. 54 sec. to Carlton, 20·9 miles (total 13 min. 38 sec. for 16·7 miles, at an average of 73·1 m.p.h. for nearly 17 miles); 25 min. 6 sec. to Tuxford, 26·4 miles; and 27 min. 46 sec. to mile-post 134½ just beyond (the summit), 29 miles. There were bad signal delays through Retford (33·1 miles, 32 min. 4 sec.), but even so the 12·3 miles from Sutton, over Piper's Wood Summit, to mile-post 154 were run in 11 min. 6 sec., prior to yet further signal checks outside Doncaster, which was reached in 51 min. 32 sec. notwithstanding. My correspondent points out that, despite 13 min. 40 sec. overtime at stations, and checks causing an aggregate loss of 4¾ min., at the most modest estimate (too modest, in my judgment), only 3½ min. were lost on such a schedule as that of the 10.10 a.m. down, with a 410-ton train-load. Net start-to-stop times on the three successive stages — London - Peterborough, Peterborough-Grantham, and Grantham-Doncaster respectively—were 77, 32½, and 48¼ min. respectively, equivalent to a net non-stop time of something like 153 min. for the 156 miles from London to Doncaster.

The journey of No. 4472 on the 4 p.m. down, in the seventh column, was of no particular note after the foregoing—at any rate, to Peterborough—in view of the easier time allowance of 87 min., which was easily maintained despite three checks. The highest speed was 75 m.p.h. in descending Ripton bank. After Peterborough, with a reduced load of 325 tons, some smart running was made to Grantham, however, the Corby-Stoke time of 3 min. 25 sec., with its minimum rate of 53½ m.p.h., being the fastest of the series. After being slacked to 50 m.p.h. by signals at Helpston, we were doing 60 at Bytham, 53½ on the 1 in 200 before Corby, 55½ just beyond, and 53½ again at Stoke summit, the actual fall in speed up 3 miles at 1 in 178 being 2 m.p.h., with this 325-ton train-load. After that



INVERNESS-PERTH EXPRESS AT FORRES.
Highland 4-6-0 locomotive of "Clan" Class.

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we ran from Grantham to Newark in 16 min. 55 sec., start-to stop, and from there to Retford in 21 min. 50 sec., the latter time including a minimum rate of 56½ m.p.h. at Markham Summit.

No. 1479 did finely to Peterborough with a tremendous train, on the 10.10 a.m. down, both signal checks being very slight. We touched 55½ m.p.h. at Wood Green and 74 at Hatfield, with an intervening minimum of 46½ at Potter's Bar; then came the check at the 20 mile-post to 57 m.p.h. At Langley, however, we were doing 66 an hour, at Hitchin 77½, and past Three Counties we maintained 80½ for a couple of miles, tailing off to 68 at Sandy, 70½ at Tempsford, 58½ at St. Neot's, and 67 at Offord, the engine having now been eased. A minimum of 48 up Stukeley and a maximum of 74 at Holme completed the run to Peterborough well inside time. After Peterborough, we did not exceed 59 an hour at Essendine, and fell to 47½ before Corby and 46½ at Stoke Summit, but more than kept time to Grantham.

The last column records one of the very few times on which I have noted time lost by a Great Northern "Pacific," apart from delays, on its own section of the railway. The train was, of course, the 5.45 p.m. down, with its usual load. I might mention that, since these lines were written, arrangements have been made to run both this express and the 1.55 p.m. into King's Cross in duplicate daily between King's Cross and Doncaster. It is hardly possible to stigmatise a loss of 4 min. to Grantham as "bad," when the engine is conveying the modest load of 510 tons behind the tender; but any such loss is, in my experience, a rare occurrence. Speeds were 53 m.p.h. at Wood Green, 46½ at Potter's Bar, 68 at Hatfield, 51 at Woolmer Green, 75 at Three Counties, 67 beyond Arlesey, 71½ between Biggleswade and Sandy, 66 at Tempsford, 60—excellent, this—at St. Neot's, 67 at Offord, 48 at Leys Summit, 70½ at Holme and 56½ at Fletton Junction—no mean exhibition, even in face of the loss of 1½ min. Beyond Peterborough we did not get above 57½ m.p.h. at Tallington, and fell to 47 before Corby and 40½ at Stoke, losing thereby a further 2½ min. to Grantham. The net equivalent non-stop time from London to Grantham on even such a run as this would be very little over the two hours—probably about 122 min.

And now for the up journeys. First of all Driver Alcock treated us to the classic that appears in column 1. Prior to this effort we had run the 17·4 miles from Doncaster to Retford in 19¾ min., start-to-stop (with 250 tons), breasting Piper's Wood at 53 m.p.h., and maintaining 71½ to 68 an hour all the way from Scrooby troughs to shutting off steam for Retford; then, with the full 285 tons, we had accelerated to 42½ up to Markham, and had run the 33·1 miles from Retford to Grantham in 36 min. 20 sec., touching 74 an hour before Crow Park, and passing Newark at 66, Claypole at 65, Hougham at 64 (all astonishing uphill figures), and Barkston at 58½, whereby we entered Peascliffe Tunnel at 55 m.p.h., and ran from Newark to Grantham stop in 15 min. 5 sec. From Grantham we accelerated to 41 m.p.h. up the 1 in 200 to Stoke; then we passed Corby at 70½, Bytham at 79, and touched 83½ m.p.h., easing rather rapidly down to 62½ at Helpston. After the usual slow passage of Peterborough (which appears to cost the trains in either direction from 2 to 3 min. in running time, according to the relative severity of the slack), we got up to 68 an hour at Holme, and mounted the 4½ miles at 1 in 200 past Ripton at a minimum of 55½ m.p.h.—an extraordinary achievement.

Touching 75 at both Huntingdon and Offord, we breasted St. Neot's at 62½, and then, after reaching 70½ at Tempsford ran all the way on to Three Counties (with a momentary fall to 60 at Langford) at 65–66 m.p.h. without intermission. Thus, passing Hitchin at 55 m.p.h., we completed the 27 miles from Huntingdon—over which down expresses make such records, and which is looked upon as entirely in their favour—in the wonderful time of 25 min. exactly. Thereafter we fell to 48½ m.p.h. at Stevenage, but touching 77½ before Hatfield, we made another record by running from there up to Potter's Bar in 4¾ min., with a minimum speed of exactly 60 an hour! We had reached 75 m.p.h. at Oakleigh Park when we were checked for tunnel repairs, and signal checks followed between Finsbury Park and King's Cross. For all that, we had run the 105·5 miles from Grantham

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in 109¾ min., or 108 min. net—2 min. less than the schedule of the old Sheffield flier, which carried exactly half the load! Schedule of this train is 111 min. From Peterborough we took 77 min. 25 sec., or 75¾ min. net, and from Huntingdon 58 min. 50 sec., or 57 min. net. Such travelling as this proves that the "Atlantics" have plenty of life left in them yet!

Over the shorter course from Peterborough No. 4426 ran pretty nearly as well in the run shown in the next column. The train was the up Harrogate express due in King's Cross at 5.7 p.m., and left Peterborough dead on time, with 83 min. allowed to London, so that the reason for the haste was not apparent. Speeds of 66 m.p.h. at Holme and 49½ at the summit of Ripton bank heralded the high maximum of 75 an hour at both Huntingdon and Offord; magnificent running followed, with a minimum of 65 an hour at St. Neot's, and speeds of 71½ at Tempsford, 66 at Sandy, 60 at Langford, 65 at Three Counties, and 55 at Hitchin, with the result that we actually beat by 5 sec. the 25 min. of the last run from Huntingdon to Hitchin—a most brilliant piece of work for an "Atlantic." Having breasted Stevenage at 47½ m.p.h., and touched 72½ before Hatfield, the driver eased his engine, and some delays followed also; otherwise we should have been in without difficulty in 79 min.—the "crack" up booking, years ago, of the three-coach 11 a.m. Nottingham to London "flier."

There was little exceptional about No. 1431's run, in the next column, on a schedule of 120 min., save that we gained over 2 min., with three intermediate checks, our net time being 8 min. under booked. Stoke Summit was passed at 42½ m.p.h., and we had reached 80½ m.p.h. before the p.w. check near Essendine; the best speed attained between there and Peterborough was 65 m.p.h. A fine ascent was made to Leys Summit, with a minimum of 52½ m.p.h., and we touched 74 through Huntingdon; after that the principal speeds were 57½ at St. Neot's, 66 at Tempsford, 60 at Three Counties, and 46 m.p.h. at Stevenage. The rest of the journey in was delayed.

No. 1444 made a plucky run on one of those fearsome evenings of wind and rain that enlivened the last Christmas season, with a tremendously heavy load—for an "Atlantic"—including the electrical equipment which, as I have said before, appears not to be without its influence on the running. Of the summit speed at Stoke I failed to take a record, but we attained 80½ an hour below Little Bytham, and sustained speed well beyond, passing

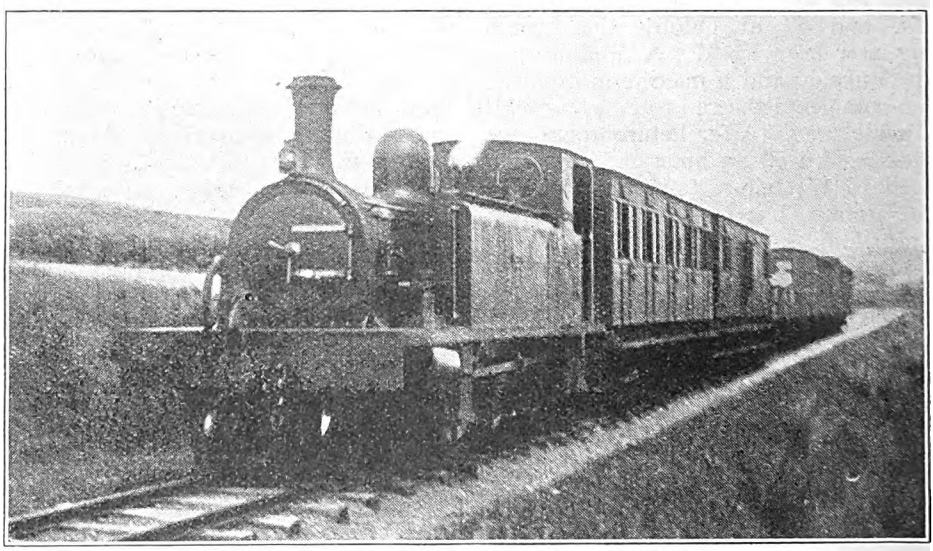

Photo.] [*J. Macartney Robbins.*

COUNTY DONEGAL JOINT RAILWAY.

4-6-0 tank engine No. 8, "Foyle," on mixed train between Fintown and Glenties.

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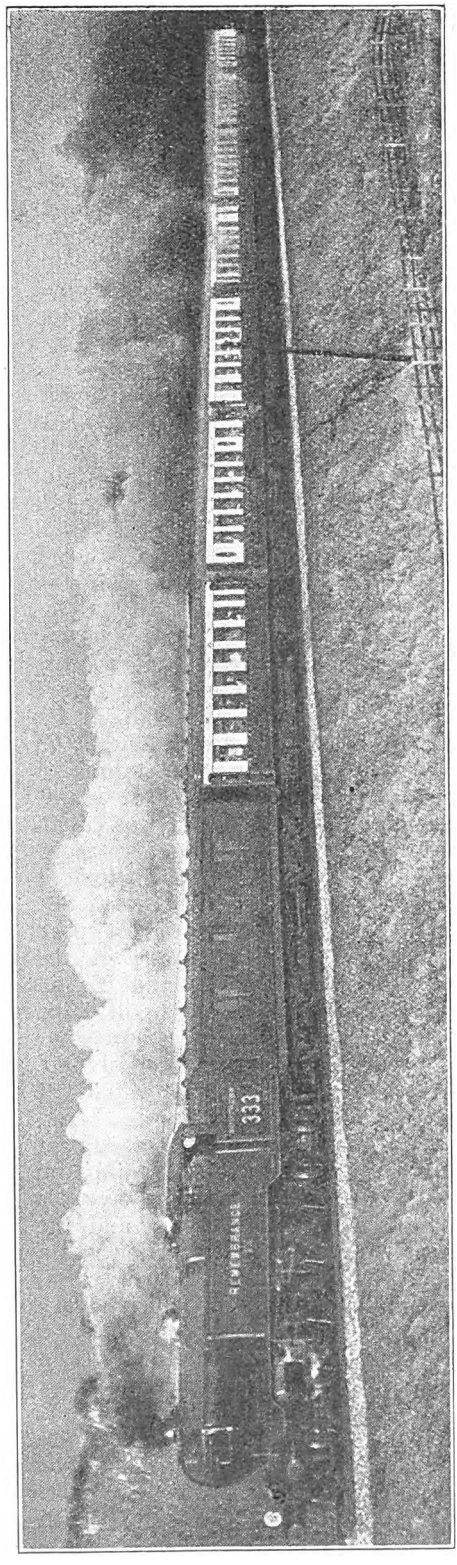
Tallington at 76½, Helpston at 71½, Werrington at 65, and shutting off steam for Peterborough at 64 m.p.h. Peterborough was passed practically at a walking pace, and in consequence we did not get above 60 an hour at Holme; but the minimum above Ripton was 42 m.p.h., and we passed Huntingdon at 68 an hour. There was nothing much to note subsequently, save that we were whistling for signals before Hitchin, and were severely checked through Welwyn; but for all that the schedule time—this was the up evening "Scotsman," due at 10 p.m.—was all but maintained.

In the next column is found a run on the same express, with a still heavier load, the "Atlantic" in this instance being allowed the services of a 4-4-0 pilot to London. Between the two of them some tremendously spirited work was put up. There was, first of all, the quickest ascent of the series from the Grantham start to Stoke, which was passed at 41½ m.p.h.; after that we touched 80½ m.p.h. yet once again between Bytham and Essendine, and were still doing 70½ an hour as we passed over Werrington water-troughs. There was a nasty check before Peterborough; but we reached 62½ m.p.h. at Holme, ran up Ripton bank at a minimum of 49½, and touched 72½ at Huntingdon, as a prelude to some very fast travelling over the undulating, but very gradually rising, length to Arlesey. In fact, but for the cruel check at Three Counties, which practically stopped us, we should have beaten both the previous records from Huntingdon to Hitchin. As it was, we passed St. Neot's at 64½ m.p.h., and actually touched 74 m.p.h. at Tempsford—in my experience a unique feat in this direction of running. We were doing 64½ an hour when we passed Arlesey, and from the Three Counties check we accelerated up the stiff rise to Hitchin to 43½ m.p.h., and further to 45 at Stevenage. Speeds of 70½ m.p.h. at Hatfield, 58½ at Potter's Bar, 74 at Wood Green, and 60 at Finsbury Park sufficed to bring us in on booked time.



[O. J. Morris.

DOWN "SOUTHERN BELLE" SOUTH OF QUARRY BOX.

Memorial locomotive No. B333, "Remembrance," and train of new Pullman cars.

Photo.]

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There next follow the three "Pacific" runs, all of them good and the last one a brilliant performance. The train was the up day "Scotsman" in each instance, allowed 123 min. from Grantham to London, so that the actual gains on schedule, mostly in recovery of time previously lost, ranged from 4 to 10 min., and the net gains from 8½ to 12 min.! Talking of gains, on another occasion, by the help of "Pacifics," we regained 14 min. from Darlington to Grantham, and on yet another 9 min. were regained from Newcastle to Grantham, the "Pacific" in the latter case running into Grantham 5¼ min. early. This reminds me, too, that on my last trip on the 10 a.m. down, we ran into York all but 7 min. early, Nos. 4385 (4-4-0) and 4401 (4-4-2) having covered the 82·7 miles from Grantham in 90 min. 10 sec. But I must not venture north of Grantham, in view of limitations of space.

No. 1475 did well up to Stoke, passing there at 44 m.p.h., and then, accelerating very rapidly to Corby, touched 79 before Essendine, keeping up 70½ m.p.h. as far as Werrington. We passed Holme at 65 an hour, maintained 50 to the summit of Ripton bank, and touched 74 at Huntingdon, after which the engine was eased, and no further speeds of note were registered. No. 1474, after breasting Stoke at 42½ m.p.h., flew through Bytham at 83½ m.p.h., and touched 85—the highest speed I have yet recorded with one of the "Pacifics"—between there and Essendine. At Werrington we were still doing 69 an hour, and 64½ when steam was shut off for the bad check outside Peterborough. After that we attained 62½ m.p.h. at Holme, only fell to 51 on Ripton bank, touched 71½ m.p.h. at Offord, and 66 at Tempsford, with an intervening minimum of 61 at St. Neot's. From there onwards things were taken more easily, and the only further feature worth mention was a maximum of 74 m.p.h. at Wood Green, after a slight slack through Oakleigh Park Tunnel.

The magnificent effort of No. 2546 on the up journey is a fitting complement to that already recorded behind the same engine on the 10.10 a.m. down. We were 10 min. late away from Grantham, but at Hatfield we were in front of time. Indeed, at Sandy the "Pacific," with 400 tons behind the tender, was only 15 sec. behind No. 4436, in the remarkable run first described; and so far as net times are concerned, it is striking to note that No. 2546, with her heavy train, maintained the 111-min. booking from Grantham to London of the far lighter 9.44 a.m. up. After passing Stoke Summit at 43 m.p.h., we reached 71½ an hour at Corby, 82 at Bytham, and maintained 83½ for a couple of miles between there and Essendine, afterwards falling to 75 from Tallington to Helpston, 70½ at Werrington, and 66 on shutting off steam for Peterborough. The 17·6 miles from Corby to Werrington were covered in 13 min. 55 sec.—the fastest time of the series—at an average of 76 m.p.h. Then we got up to 64½ m.p.h. at Holme, breasted Leys Summit at a minimum of 51, touched 72½ at Huntingdon and Offord, fell to 61½ at St. Neot's, reached 71½ again at Tempsford, and maintained from 62½ to 58½ m.p.h. from Sandy on to Three Counties; Hitchin was passed at 52½ m.p.h. and Stevenage at 47, while we touched 71½ before Hatfield and fell to 53 at Potter's Bar. Actually to regain 10 min. in one single run of just over a hundred miles, on an important express, was to me a novel experience, and, as already explained, the net gain was 12 min.

A sum of the best times from this table, by the way, gives a total of 105 min. 20 sec. from Grantham to King's Cross, 75 min. 10 sec. from Peterborough, 56 min. 35 sec. from Huntingdon, and 32 min. 10 sec. from Hitchin—virtually a mile-a-minute gait throughout. In the opposite direction, a similar analysis gives 36 min. 30 sec. from King's Cross to Hitchin, 58 min. 15 sec. to Huntingdon, 74 min. 50 sec. to Peterborough, and 106 min. 5 sec. to Grantham—a singularly close agreement between up and down journeys, the difference being only one of 20 sec. as regards Peterborough and 45 sec. as regards Grantham. To my mind the most impressive work on the up journey was that achieved on almost every journey between Huntingdon and Hitchin, while on the down journey some of the times from Essendine up to Stoke Summit were quite extraordinary. I fear that "Pacific" exploits further north must now be left until a later issue.

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1825-1925.

III.—DEVELOPMENT OF WORLD'S RAILWAYS.

By J. F. GAIRNS, M.Inst.T., M.I.Loco.E.

ALTHOUGH Great Britain has the honour of inaugurating the world's railway system, and its railways are still probably the busiest so far as the amount of traffic operated is concerned, the British Isles account for quite a small proportion of the total railway mileage of the world. Indeed, even including British possessions of one kind or another, the total is only about a quarter of the whole, though if countries where British interests are concerned are added, it rises to a level comparing on approximately equal terms with the United States, which have some 265,000 miles out of the world's total of about 750,000.

On the basis of continents, too, North and South America together have nearly 400,000 miles of railway against Europe's 240,000 or so miles. Asia comes next with about 75,000, followed by Africa with 35,000, and Australasia with 26,000. So far as individual countries are concerned, however, apart from the United States with its 265,000 miles, the only countries which have a greater railway mileage than the British Isles are—Canada (40,000), British India (38,000), and France (33,500). The pre-war totals recorded for Germany (39,000), Austria-Hungary (29,000), and Russia, including Siberia, Finland, &c. (54,000), would also claim consideration under this heading, had it not been for the fact that reallocations and geographical changes have altered the situation in essential respects. Of the total mileages specified, about half the railways in Europe and Africa are State-owned, and about one-eighth of those in North and South America together, whereas in Asia the proportion is approximately two-thirds, and in Australia some 95 per cent.

Credit for inaugurating railway construction, following the lead given by the British Isles, depends upon somewhat uncertain information, but, according to generally accepted data, United States railways start from 1827 and those of France from 1828. In 1835, both Germany and Belgium opened railways, while in 1836 Canada completed its first line. In 1837 Austria followed, in 1838 Russia, and in 1839 Italy and Holland. During the next ten years Switzerland, Hungary, Denmark and Spain made a start, while the 'fifties added Chile, Brazil, British India, Norway, Sweden and the Argentine Republic to the list of countries owning railways. By 1870, Turkey, Peru, Portugal, Uruguay, Mexico and Roumania had been added, while by 1880 Australasia, Japan and various parts of Asia had contributed more or less considerable additions to the railway mileage of the world. In 1883, China had constructed its first railways, and since that date practically every state or country in the world has constructed railways to such an extent that now there are very few where the mileage is less than 1,000, and those which have not reached that figure are small in area and population.

There are, of course, wide differences between the railways of foreign countries, particularly in regard to the amount of traffic operated. Thus, in parts of the United States and Canada, in the vicinities of the large cities and in the great manufacturing areas, the railways have to deal with traffic under conditions more or less similar to those which apply in the more populous and industrial districts of Great Britain, and in some instances, as, for example, in the coal areas of the United States, the railways may handle traffic on even a greater scale. But a considerable proportion of the world's railway mileage is used either for relatively infrequent but heavy trains or for traffic on a comparatively very small scale and sometimes designed more to open up new districts for cultivation and development than to produce revenue on a really satisfactory basis. Thus, in the United States, there are probably not more than 40,000 miles of railway which would be regarded as busy from the British point of view, though the fact that there are many long Trans-Continental and other lines which carry

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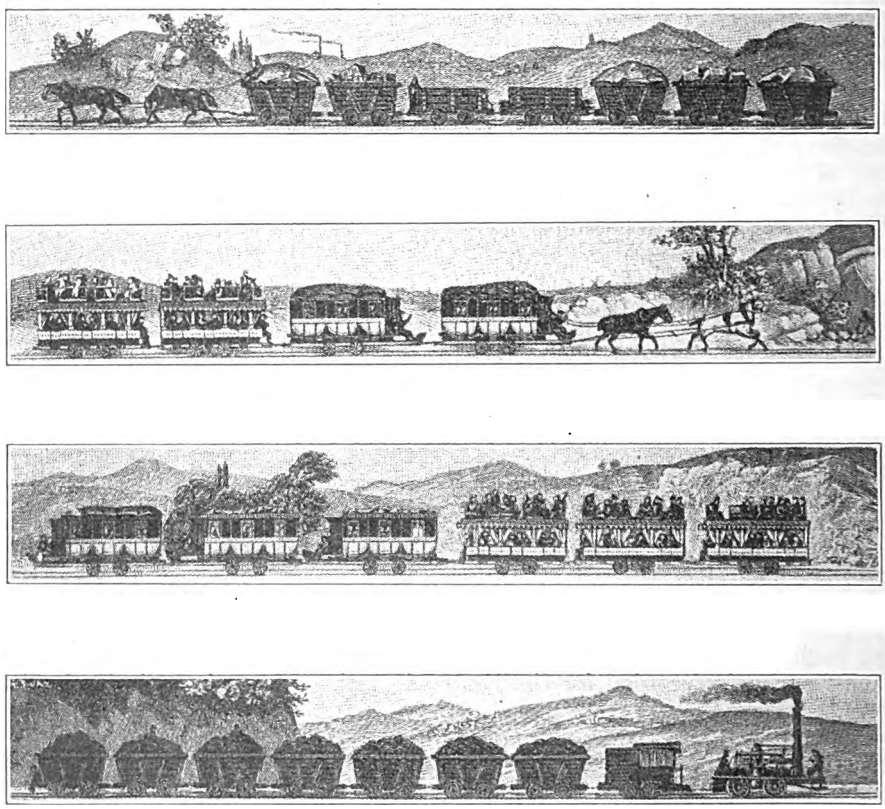
heavy traffic throughout somewhat discounts the fact that, intermediately, there may be relatively little traffic.

Canadian, Indian and other railways would, to a certain extent, come under the same classification. India has, however, a huge population to serve, though consisting largely of natives, to whom a liking for railway travel is rather a modern development than due to actual necessity, while in Canada, Australasia, South America and elsewhere the railways have to play an important part in opening up new areas for cultivation and development. In Belgium the concentration of a considerable population in a small area calls for railway accommodation on a scale which is more generous than in any other country, although the facilities are largely in the nature of light railways which we might be inclined to class rather as steam tramways. Similar developments are found in France, Germany and other parts of Europe.

In Switzerland, the needs of tourist traffic have counted for a great deal, and, in addition, there are numerous mountain lines, usually of rack type, the main purpose of which is to cater for visitors and tourists. In Africa, railways are largely concentrated in the south, although there are considerable mileages in Egypt and the Sudan and in the French Colonies and other countries bordering the Mediterranean. Intermediately, Nigeria and Kenya, the Gold Coast, Sierra Leone and various protectorates or colonies owned by our own and other nations have also developed railways to a fair extent, though, even now, Africa is by far the most backward of all the world continents in regard to the development of railway transit, when its



ST. ETIENNE AND ANDREZIEUX RAILWAY.

From old paintings, probably "improving upon fact," in the possession of the P.L.M. Railway, France.

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vast area is taken into account. Asia, too, apart from India and Japan, is still inadequately supplied with railway facilities, although a great deal of new construction is in progress or in contemplation. So far as Australasia is concerned, railway facilities are relatively fairly complete in the more developed areas, though there is pressing need for extensions to open up the very large areas which are still sparsely populated.

French railways are operated under the peculiar condition that they were built under concessions and guarantees from the State, including provisions for the taking over by the State in due course of most of the lines. In a sense, indeed, it may be said that the railways actually belong to the State, but have been equipped and are operated by companies. Owing to this condition, it has been possible for the State to restrict railway construction on an area basis, with the result that, speaking generally, each of the great systems serves mainly a particular area with relatively little competition anywhere. The main lines are, however, busy routes, and some of them are used by expresses which rank among the world's fastest. Cross-country lines are largely worked by what are termed "omnibus" trains, that is, by relatively infrequent stopping trains which are often rather of a mixed character and which are not usually noted for speed. There are also numerous railways of a purely local character. Of the French companies, the P.L.M. is the most important, and as it has a total of some 6,000 route-miles it ranks as one of the largest individual railways in Europe. The French State Railways, which include the Western line taken over some years ago, have a mileage of about 5,000, the Eastern some 3,700, and the Northern about 2,500, so that they are by no means small systems.

As in Great Britain, there were, before passenger railways were introduced, lines of a colliery character. The St. Etienne and Andrezieux Railway, now part of the P.L.M. system, dates back to 1828. This line was used for coal traffic, the wagons being at first hauled by horse-power. Judging from the early pictures, reproduced on page 206, from a collection in the possession of the P.L.M. Company, this line had developed its activities so far as the conveyance of passengers also. On this line, further, it seems to have been a practice to make use of gravity, though whether this extended to passenger transport, as suggested by one of the pictures reproduced, is a matter of doubt. One may incline to the view that these pictures show what might have been rather than what actually occurred, though the collection of views is distinctly interesting.

One of the first public railways in France was that from Paris to St. Germain, opened for traffic in December, 1837. Part of this was originally equipped for atmospheric traction, the remainder being worked by steam locomotives, as was the whole eventually. This line, 13 miles in length, constituted one of the *lignes de banlieue* of the Western Company. The Orleans Company obtained its concession for a line from Paris to Orleans in 1838. The concession of the Paris and Rouen Railway Company was given in 1841, and the line opened for traffic on May 9, 1843.

Belgium is a country of dense population and dense railway mileage, though a fair part of the latter consists of light railways doing both passenger and goods business, but more like steam tramways than railways as generally understood. Of these lines there are quite elaborate systems, and they have rendered good service in linking up the standard lines and in serving districts where it would be difficult to make a railway of main-line character pay its way. Most of the original lines were, as elsewhere, built by private companies, but in 1870 the policy was adopted of discontinuing private concessions, the State taking over the existing lines and undertaking the construction of all new projects accepted for realisation.

On the main lines, though there have been many queer locomotives and ancient types of carriages in the past, and not a few are still to be seen at work, the general practice of to-day is distinctly up to date.

Modern coaching stock, too, is of a high standard, while there are really good express services between Brussels, Antwerp and Ostend, between other towns, and on the trans-European routes which pass through Belgium. A special feature, too, is the Paris–Brussels non-stop express service. Some of the routes have very severe gradients, and the Liège incline

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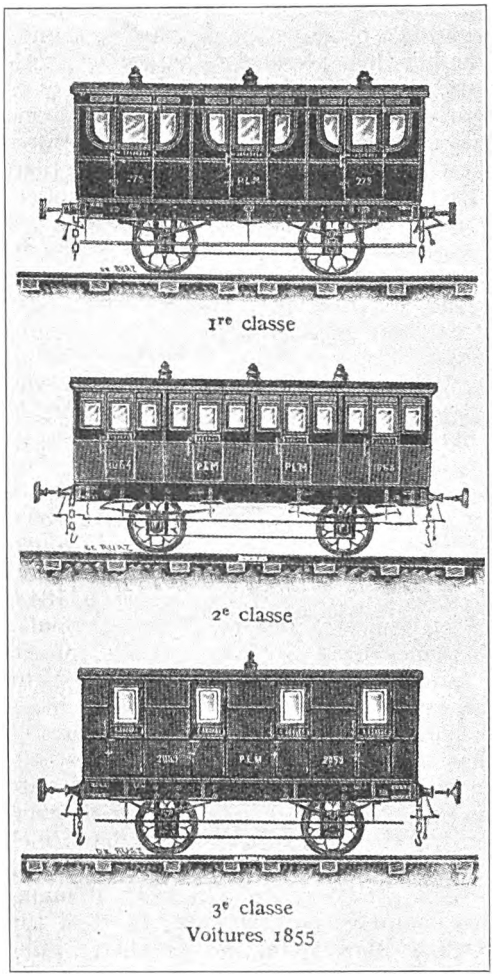

CARRIAGES OF 1855, P.L.M. RAILWAY, FRANCE.

at 1 in 53 has always been a great hindrance.

In the year 1850 the first State railway in Prussia, 7 miles long, was opened, and by the end of that year the length of line had been increased to 54 miles. From that time onwards new lines were gradually built, as many as 684 miles being opened during the year 1866, and on April 1, 1880, the total length had reached 3,760. A change of policy then took place, and it was decided to buy up for the State all the important railways that had until that time been in the hands of companies. In 1900 the length of State railways open in Prussia was 16,725 miles. In addition, 2,127 miles in other German States were under the direction of the Prussian Minister of Public Works, 590 miles of which lay in Hesse, the railways of which State were incorporated with those of Prussia by the Treaty of 1896.

In all the German States there are also considerable mileages of light and local lines, together with tramways. In Germany, too, as in Belgium and elsewhere, four classes are provided for, though frequently trains do not provide for particular classes, and may be 1; 1 and 2; 2 and 3; 1, 2 and 3; 2, 3 and 4; or even 4th class only. Corridor trains were introduced in 1892. International Sleeping Car trains were inaugurated in 1894.

Besides the Prussian lines, there are those of Bavaria, Saxony, Baden and Wurthenburg, while the Alsace-Lorraine railways, originally French, were German from 1870 until their return to France after the Great War. To a great extent, each of the individual State systems was operated independently, but there was a certain unity of direction and many inter-relations.

In early days all the systems had many, to us, queer-looking engines and antiquated types of vehicles, but modern stock is quite good, including many notable locomotive designs, some of advanced type, together with coaching stock of a high order. Speaking generally, there have never been any record railway runs, but good and reasonably frequent express services were provided on all main routes before the War, and many of the schedules now in force approximate to pre-war conditions. A special feature of German railway practice has always been the extent to which freight traffic has been cultivated in national interests, though the situation is now somewhat different in view of the conditions under which the German railways are operated in view of reparation and other factors. While there are no great main lines operated electrically, there are many electric local railways.

Owing to geographical re-arrangements resulting from the Great War, it is necessary to consider Austria, Hungary, Roumania, Bulgaria, Czecho-Slovakia, Jugo-Slavia, and other states collectively. There were, and still are to some extent, a fair number of more or less private railways, but for the most part the railways are State-owned or operated under con-

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ditions which give the State a large measure of control. In many parts gradients are severe, for a large number of mountain districts are served, and several of the trans-Continental routes which traverse these countries involve the crossing or piercing of mountain ranges. To Austria belongs the credit of building one of the first lines to penetrate the Alps, this being the Semmering line, now part of the main line connecting Vienna with Trieste. This was opened in 1867, and advertisements of the period announced that express passenger trains between Munich and Verona would complete the journey in 18 hours.

Locomotive and rolling-stock practice may be considered in three main classes. First, there was the Austrian influence, which applied not only to Austria but also to Bosnia, Herzegovina and other pre-war States, the names of which have now disappeared. Secondly, there was the Hungarian type of practice, and, thirdly, a class of work, related to some extent to German methods, found in Bulgaria and other parts. In Central Europe there are numerous mountain lines, particularly in the Tyrol. Among these may be mentioned the Arlberg railway and tunnel (6 miles 587 yds. in length), the Tauern (5½ miles), Karawanken tunnel (5 miles), and Wochner tunnel (4 miles). In Switzerland most of the main railways are now included in the Swiss Federal system, but there are numerous small and local railways—a considerable proportion of rack or mountain type—maintaining a degree of independence. Some of these rack railways are still operated by steam traction in that manner, though a few have been electrified, while many of the more recent lines are electrically operated. The Jura-Simplon Railway was taken over by the State in 1903, and the St. Gothard in 1909.

The longest Swiss tunnel is the Simplon (12¼ miles in length), opened in 1905 on a route connecting Switzerland with Italy. The St. Gothard tunnel (9½ miles in length) also carries Swiss-Italian traffic, and for many years shared with the Mont Cenis (opened for traffic in 1871, 7½ miles in length) distinction as one of the two longest tunnels in the world. It was completed in 1882, together with its railway approaches, including the famous spiral tunnels. The Loetschberg tunnel (9 miles in length), together with the Loetschberg Railway, was opened for traffic in 1911. Another very long tunnel is the Albula (19,242 ft. in length), completed in 1902 in order to carry the Rhaetian Railway (metre gauge) through the Rhaetian Alps. There is now a great deal of electric traction in Switzerland, including a number of mountain sections. As might be expected, gradients are systematically severe almost everywhere, and there are numerous engineering works of an expensive and complicated character.

In Italy numerous previously independent lines were taken over by the State on July 1, 1905. Here, also, there are many mountain lines, particularly in the north, though railways in other parts have frequently involved difficult engineering operations. A number of trans-Continental trains reach Italy from the north through France or Switzerland. Locomotive and rolling-stock practice in Italy is distinctly characteristic, frequently including features differing strongly from either French, German or Austrian practice.

Although Russia has a considerable mileage of railway, in proportion to its vast area it is very badly served in this respect, and, so far as one can judge from information available, has since the war dropped back to a situation which is probably not greatly superior to that which existed fifty years ago.

Spanish and Portuguese railways, while in some respects of a secondary character, are in others substantially up-to-date concerns, though many of the local lines and the country branches would rank as somewhat primitive. On main routes, however, there are quite creditable through expresses, though, owing to the fact that in Spain and Portugal the gauge is 5 ft. 5¾ in., trains cannot run through from France, and through passengers therefore require to change. In Spain most of the railways are in private hands, though recently they have been taken over by the so-called "Directory," thus approximating to State ownership conditions. In Portugal there are both State and private lines.

Dutch railways are largely owned by the State, but are worked by private companies. In general, locomotives and roll-

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ing-stock, though usually of smaller types, are quite creditable, and the engines do good work on the relatively flat main lines, especially when one takes into account the great frequency with which waterways have to be crossed and the numerous bridges calling for reduced speed. Some of the trans-Continental trains become quite heavy during the seasons.

In Denmark the railways are mostly owned by the State, a special feature being the train ferries, by which lines on the various islands which make up the kingdom are enabled to provide through facilities. Some of these ferries work considerable distances, the longest being 24 miles. Norway and Sweden have fairly good railway facilities throughout the more populous coast areas, but among the mountains railways are necessarily few and far between. Some of the latter lines rank as notable engineering undertakings, with severe gradients, notable bridges and long tunnels. The first railway in Norway was one between Christiania (now Oslo) and Eidsvold, built by British capitalists under arrangement with the Norwegian Government. Most of the railways in both countries belong to the State, a considerable proportion of the branches and more remote sections being of 3-ft. 6-in. or metre gauge.

Railway enterprise in South Africa commenced in 1860, the first railway being a 4-ft. 8½-in. gauge line about 2 miles in length, extending from The Point to Durban in Natal. As explained by Mr. G. H. Dawson, in an article published some time ago in the *South African Railways and Harbours Magazine*, in the southern portions of Africa railway construction was first commenced at Cape Town during the early part of 1870, when a line of 4-ft. 8½-in. gauge was built to Wellington by a private company, the distance being 63 miles. It was taken over by the then Cape Government in 1873, at a cost of £772,000. After this purchase railway extension was undertaken at once, and an advance made inland. The line Cape Town to Wellington was relaid to a 3-ft. 6-in. gauge, which has since been the standard gauge, and rapidly extended to Tulbagh Road (94 miles) in 1875; to Mulders Vlei (1876), and thence on to De Aar (500 miles), which point was opened in 1884, forty-one years ago. De Aar is now one of the most important junctions in South Africa.

In the midland parts of Cape Colony the first section was opened from Port Elizabeth to Uitenhage (21 miles) in September, 1875, and to Addo on the main line to the interior the same year; to Graaff Reinet (184 miles) from Port Elizabeth, and Addo to Grahamstown in 1879. Colesberg, on the northern borders of the Cape Colony, was reached October, 1883. On the eastern side construction was first started during 1876, and was pushed on to Breedbach in the same year. An entry to the neighbouring Orange Free State, *via* Albert Junction, to Orange River Bridge, was made in May, 1892. From 1870 other lines were being quickly established in various parts of Cape Colony. After the discovery of diamonds in Kimberley a line was immediately pushed forward from De Aar, and opened on November 28, 1885, bringing Kimberley into touch with the ports of Cape Town and Port Elizabeth. A few years later a northward movement was made, and Vryburg was reached in 1890.

In the Transvaal and Orange River Colony construction was first started from the Cape Colony direction by a line from Port Elizabeth to Norvals Pont, thence on to Bloemfontein; this was opened December 7, 1890, was extended to Kroonstad in 1892, and was sharply pushed on to the Transvaal border and opened May, 1892. From Delagoa Bay railways were built to Komati Poort, and to the Transvaal border, then onwards towards the Witwatersrand, Machadadorp being reached and opened in 1894, where the line was linked up to that from the west *via* Pretoria. The Natal Government Railways were commenced in 1878, and reached the Transvaal *via* Charlestown in 1895, and thereon to Union Junction, on the Cape–Germiston line, which was linked up the same year. The union of the four Colonies—Cape, Orange Free State, Transvaal, and Natal—took effect May 31, 1910, at which time there were 7,038 open miles in the four provinces. In all parts of South Africa gradients are severe, and in quite a number of places it has been necessary to construct deviation lines in order to enable modern traffic to be effectively operated. Certain of the great main lines are in course of

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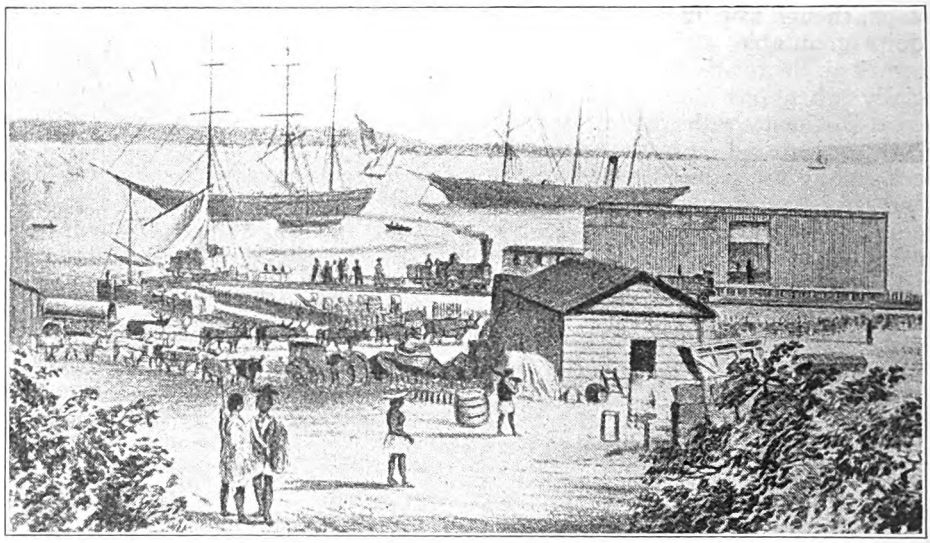

THE FIRST RAILWAY STATION IN AFRICA—"THE POINT," DURBAN.

(*From the "South African Railways and Harbours Magazine."*)

electrification, and electrical working is already in operation between Glencoe and Pietermaritzburg.

In Rhodesia the first railway, running up from Vryburg, where that of the Cape line ceases, was opened to Bulawayo in 1897. The line from Beira to Umtali and Salisbury was completed in 1899, and the connection between Salisbury and Bulawayo was constructed in 1902, thus giving Rhodesia a trunk line running right through the country from Francistown to Umtali. Another trunk line running from Bulawayo north-west to the Victoria Falls, and thence in a northerly direction, has now reached the Congo territory, from which lines will probably be constructed in a westerly direction to Lobito Bay and northward to Lake Tanganyika *en route* to Khartoum and Cairo.

Other African railways in which British interests are concerned include the New Cape Central in South Africa; the Benguella or Lobito Bay and Railway, extending from Lobito Bay in Portuguese West Africa to Katanza; the so-called Uganda Railway from Mombasa in British East Africa (or, as it is now termed, Kenya) to Victoria Nyanza (opened 1903); the Sierra Leone Government Railways (the first portions of which were opened in 1896); the Nigerian Railways (developed from the Lagos Railway, opened in 1901); and the Gold Coast Government Railways (the first section of which was opened in 1901). Some of these are narrow gauge.

There are also railways of interest in Belgian-Congo, French Colonies (those in Algiers, Morocco, &c., are quite substantial concerns), German Colonies (mostly now in British hands), and in Italian Colonies, but it is not necessary to consider these in detail. The Egyptian lines, however, call for definite reference. In 1852, under the reign of Abbas Pasha, Viceroy of Egypt, Mr. Robert Stephenson was commissioned to make a line from Gabbary (Alexandria) to Cairo. Track-laying was commenced simultaneously from Cairo northwards as well as from Benha to Cairo. Pending the construction of an iron bridge at Kafr-el-Zayat, a steam ferry was used there. A disastrous accident occurred on May 16, 1858, when a train fell into the Nile. The "Desert Line" from Cairo to Suez was opened early in 1858. All the earthwork and buildings were carried out by means of the "corvée" (*i.e.*, forced labour). The land was taken without payment.

The construction of a line from Boulac Dacrour to Minieh was commenced in 1867. The Junction line from Cairo to

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Boulac Dacrour was not then in existence, and passengers had to find their own way to Boulac Dacrour until 1891, when the Embabeh Bridge over the Nile near Cairo was opened to traffic. In 1869 the "Desert Line" to Suez was taken up, and replaced by a new line from Ismailia to Suez. On November 18, 1876, a Khedivial Decree was issued placing the control of the railways under a mixed Administration, composed of a President and two Directors. But on November 20, 1905, the International Board ceased to exist, and the members of that Board were replaced by a General Manager. The Upper Egypt line was extended from Assiout to Luxor, and afterwards to Assouan. By an arrangement, dated February, 1902, with the Suez Canal Company, the Administration built a new standard gauge line from Ismailia to Port Said to replace the narrow-gauge steam tramway belonging to the Canal Company.

Besides the State railways there is a big system of light railways, serving as feeders to the main lines. They are mostly of 2-ft. 6-in. gauge, and date from concessions given in 1907. Practically forming extensions of the Egyptian State Railways, though actually connected only by Nile steamer services, is the Sudan Government system. The Atbara–Red Sea section was opened in 1905.

Cape Town & Wellington RAILWAY.

OPENING OF THE LINE FROM CAPE TOWN TO THE EERSTE RIVER STATION.

NOTICE is hereby given that, with the sanction of His Excellency the Governor, that portion of the RAILWAY between Cape Town and the Eerste River Station, will be opened for PUBLIC TRAFFIC, on and after

Thursday, the 13th inst.

Full particulars of the intended times of departure and arrival of Trains, as well as Fares, Rates, &c., are given in the Company's Printed Tables

W. G. BROUNGER, General-Superintendent.

Cape Town, 10th Feb., 1862.

Cape Town & Wellington Railway.

On and after the 13th instant, and until further notice, the following will be the TRAIN TIMES and PASSENGER FARES.

TIME TABLE, FEBRUARY, 1862.

DOWN TRAINS.

STATIONS.	Week Days				Sundays		Fares.		
	h. m. a.m.	h. m. a.m.	h. m. p.m.	h. m. p.m.	h. m. a.m.	h. m. p.m.	Class 1	Class 2	Class 3
Leave CAPE TOWN	7 5	10 0	1 5	4 5	7 30	4 0			
Arrive at SALT RIVER	7 13	10 8	1 13	4 13	7 38	4 8	10d.	8d.	6d.
DURBAN ROAD	7 45	10 40	1 45	4 45	8 10	4 40	3s. 0d.	2s. 0d.	1s. 6d.
EERSTE RIVER	8 15	11 10	2 15	5 15	8 40	5 10	5s. 3d.	3s. 6d.	2s. 8d.

UP TRAINS.

STATIONS.	Week Days.				Sundays.		Fares.		
	h. m. a.m.	h. m. a.m.	h. m. p.m.	h. m. p.m.	h. m. a.m.	h. m. p.m.	Class 1	Class 2	Class 3
Leave EERSTE RIVER	5 30	8 30	2 35	5 35	9 0	5 30			
Arrive at DURBAN ROAD	6 0	9 0	3 5	6 5	9 30	6 0	2s. 3d.	1s. 6d.	1s. 2d.
SALT RIVER	6 30	9 30	3 35	6 35	10 0	6 30	3s. 3d.	3s. 6d.	2s. 8d.
CAPE TOWN	6 40	9 40	3 45	6 45	10 10	6 40	5s. 3d.	3s. 6d.	2s. 8d.

POSTER ANNOUNCING OPENING OF CAPE TOWN AND WELLINGTON RAILWAY, 1862.

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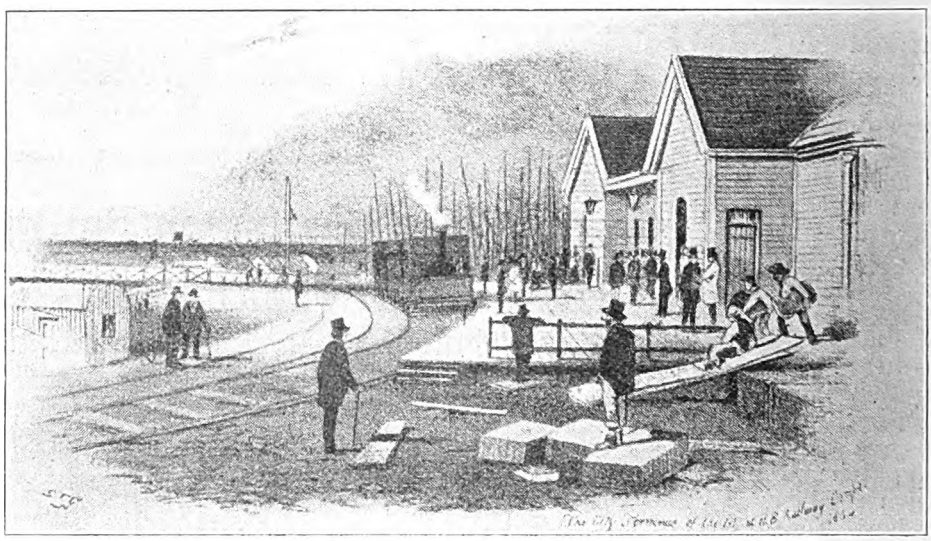
Railways throughout Australasia have been developed mainly by the respective States, though in a number of cases the earliest lines were due to private enterprise. Except in a few of the first developed districts, railways have had to open up the country, so that Government action was essential, and on the whole State ownership and operation in Australasia has proved satisfactory. In Australia itself the railways are directed by a Commissioner or Board of Commissioners more or less independent of Parliament as regards management, though, of course, dependent thereon for the voting of money and in reference to matters of policy. New Zealand, has, however, a general manager answerable to the Minister for Railways.

A vexed issue on the mainland of Australia is that of differences of gauge. This arose from early events. New South Wales and Victoria first agreed to build their railways to the 4-ft. 8½-in. gauge. On the suggestion of New South Wales, however, Victoria and South Australia agreed to use the Irish gauge of 5 ft. 3 in. as the standard, though New South Wales actually adopted the 4-ft. 8½-in. gauge. As more suitable for pioneer lines, Queensland and Western Australia introduced the 3-ft. 6-in. gauge, while South Australia built some of its country lines to that gauge, so that inter-State traffic involves transfer or change at several of the boundaries. Consequently the present railway systems, which were built in the first place to serve local and State requirements, do not give a full measure of service for inter-State trade and commerce.

Various conferences on the gauge question were held, each in turn confirming the urgent necessity for uniformity. In 1912 a conference, consisting of the Chief Engineers of the various States and the Commonwealth, recommended the adoption of 4 ft. 8½ in. as the standard for Australia. The Commonwealth Government accordingly employed this gauge for the Trans-Australian Railway, the opening of which, in October, 1917, made through connection between the Eastern States and Western Australia possible; but this railway can never give to the people of Australia a return commensurate with the expenditure incurred until such time as the present breaks of gauge are removed. In 1921 a Royal Commission was appointed to consider and report on the whole question of gauge unification. The recommendation of the Royal Commission was that the 4-ft. 8½-in. gauge be adopted, and this has now been accepted as the standard gauge for Australia.



CITY TERMINUS OF THE MELBOURNE AND HOBSON'S BAY RAILWAY, 1854.

Most of the private railways which still

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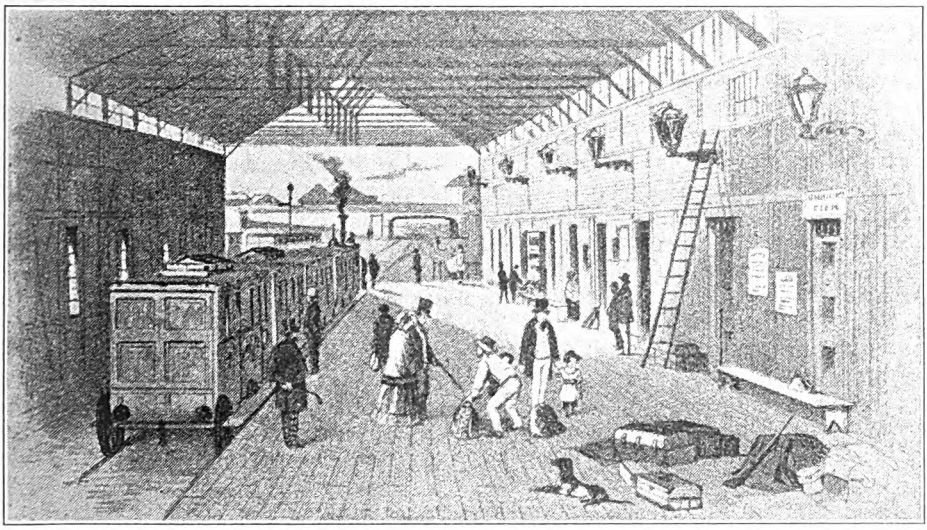
operate in Australia are of an industrial character, the Midland of Western Australia being the most extensive of those catering also for general traffic.

The trans-Australian Railway from Port Augusta (S.A.) to Kalgoorlie (W.A.), provides the only rail connection between South Australia and other States and Western Australia. Its construction, crossing the Nullarbor Plain and through barren and almost waterless territory, was a very great undertaking. Through traffic was commenced on October 22, 1917. For 300 miles there is no curve, and for the whole length no permanent stream is crossed. From Port Augusta to Oodnadatta, 478 miles, is 3-ft. 6-in. gauge, worked under agreement by the South Australian Government Railways on behalf of the Commonwealth. In Northern Territory the section from Darwin was completed on December 4, 1917, to Katherine River, 199 miles, 3-ft. 6-in. gauge, and surveys have been made for extensions southwards to join the South Australian lines. In New South Wales the Queanbeyan–Canberra line, 5 miles, 4-ft. 8½-in. gauge, is owned by the Commonwealth, and worked under agreement by the New South Wales Government Railway on behalf of the Commonwealth.

The Sydney, Paramatta and Liverpool Railway, one of the two first in Australia, was commenced in 1850 and opened for traffic on September 26, 1853. This and another projected line was taken over by the New South Wales Government on September 3, 1855, and since then all except two or three small industrial lines have been constructed and are the property of the State. The main Southern line runs from Sydney to Albury, there connecting with the Victorian Government Railways. The Western group of lines runs from Sydney to Bourke, across the Blue Mountains, while the northern section runs from Sydney, *via* the Hawkesbury Bridge, to Newcastle and to Wallangarra, where connection is made with the Queensland Government lines. There is also a South Coast line from Sydney southwards. A coastal line is nearing completion from Sydney *via* Kempsey and Grafton, which will eventually provide a shorter route between Sydney and Brisbane.



SYDNEY RAILWAY STATION IN 1856.
Sydney, Parramatta and Liverpool Railway.

In crossing the Blue Mountains there are 30 miles with gradients of 1 in 33 to 66. There were originally two zig-zag sections, but the smaller one has been replaced by a deviation with a grade of 1 in 60, and the "Great Zig-Zag," on the Western line has been avoided by a deviation line completed in 1910. Sydney has a very

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heavy suburban traffic, dealt with at the Central Station (20 platforms), and a considerable mileage has four or more tracks. Newcastle is the principal centre for coal traffic, shipping of which comes under the Chief Railway Commissioner's control. The Hawkesbury Bridge, Sydney–Newcastle line, is the most notable engineering work on the system. It has seven spans of 416 ft.

Necessarily the New Zealand North and South Island railways are operated as separate systems. South Island obtained its first railway, Christchurch to Lyttleton, 1863-7; while in North Island the first section opened was Auckland to Drury, 1867. Originally lines of both 4-ft. 8½-in. and 5-ft. 3-in. gauge were built, but in 1869 the 3-ft. 6-in. gauge was decided upon and earlier lines converted. Several lines were built by private enterprise with land-grant assistance. The New Zealand Midland Railway was built by private enterprise, but taken over by the Government in May, 1895. In 1889 railway commissioners became responsible, though in 1894 control passed back to a Minister for Railways, with a General Manager as executive chief. Owing to the mountainous character of much of the interior the South Island railways are mostly along the coast, while severe gradients are very frequent. The steepest is the Rimutaka incline (North Island), with three miles at 1 in 15, worked by Fell centre-rail locomotives. The construction of the Christchurch–Greymouth line, including at Arthur's Pass a tunnel 5½ miles in length, has been completed.

The first section of the Queensland Government Railways was that from Ipswich to Grandchester, 21 miles, opened July 31, 1865. From Brisbane, the Southern line runs to Wallangarra, 223 miles, connecting with the New South Wales railways. The Western line extends to Cunnamulla, 604 miles, a branch at 496 miles going to Quilpie, 125 miles, which line forms part of the Great Western scheme for linking up the Southern, Central and Northern Division Railways.

In South Australia railway construction was inaugurated by the Adelaide City and Port Railway, opened April 21, 1856. From Adelaide the gauge is 5 ft. 3 in., but most of the more northerly extensions are on the 3-ft. 6-in. gauge. The Port Augusta to Oodnadatta section, 478 miles, 3-ft. 6-in. gauge, was transferred to the Commonwealth, and leased by the S.A. Railways Commissioner as from January 1, 1911. It will eventually form part of a through trans-Continental route from Adelaide in the south to Port Darwin in the north of the Continent. Murray River Bridge has five spans of 120 ft. and 23 spans of 60 ft., while that over the River Neales has 19 spans of 100 ft.

Tasmanian Railways began with the line from Launceston to Deloraine, 45 miles, 1871, by the Launceston and Western Railway Company (taken over by the State in 1872), and throughout between Hobart and Launceston, 15 March, 1876, this section being purchased from the Tasmanian Main Line Railway Company in 1890.

In Victoria the line from Flinders Street, Melbourne, to Port Melbourne was opened by the Melbourne and Hobson's Bay Railway, September 13, 1854 (the first railway opened and operated in the State). Several other lines were constructed by private enterprise, though principal development has occurred under the State, commencing in 1858. Practically all private lines were taken over in 1878. Almost the whole of the State is covered by a network of lines and branches centring upon Melbourne. Trains connect with systems of other States at Albury and Tocumwal for New South Wales, and at Serviceton, Mt. Gambier and Pinnaroo for South Australia. The Melbourne suburban area involves about 143 route miles, and practically the whole is now electrically operated. Electric traction was inaugurated on certain sections May 28, 1919. In Melbourne the two great stations at Flinders Street (15 platforms) and Spencer Street (10 platforms) are connected by a viaduct carrying four lines.

Early developments in Western Australia were chiefly due to private enterprise, including the Luckeville–Yoganup line, 12 miles, opened 1871; and Geraldton–Northampton, 34 miles, 1879. These lines, built by the Western Australian Land Company, were acquired by the Government in 1896. Perth obtained its first railway in 1881, to Fremantle.

In India the relations between the railways and the State are complex and

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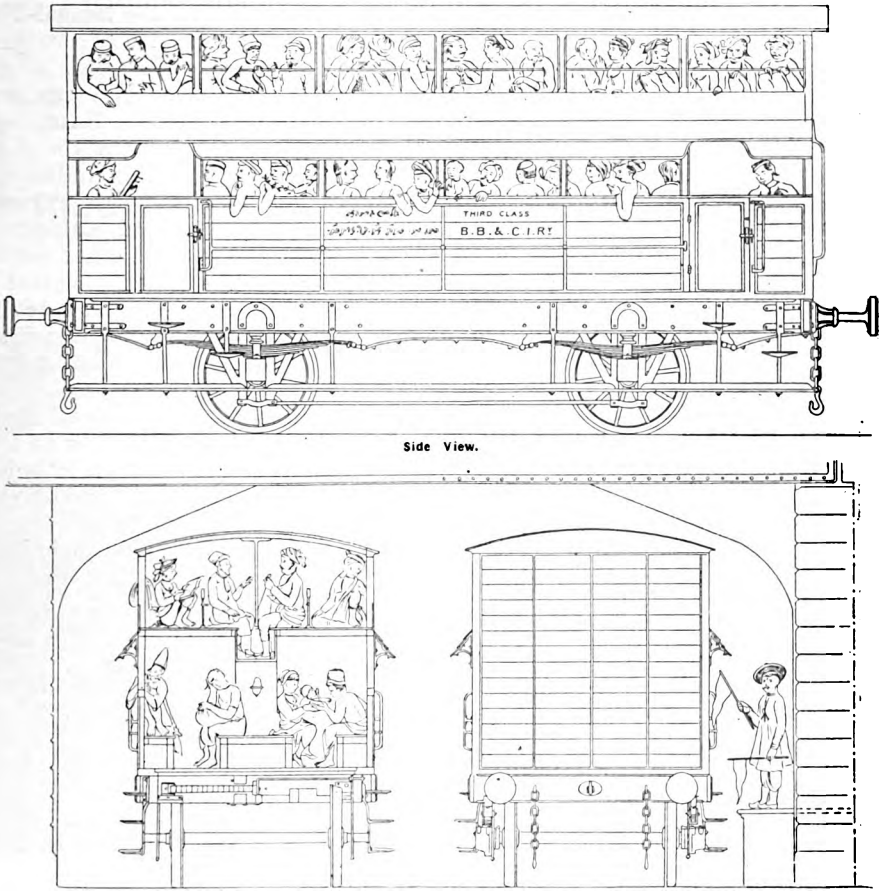
peculiar. Most of the original lines were built by companies under terms which caused them to revert to the State or to require a re-lease at the end of specific periods. Other lines were constructed by the State, and there are complicated arrangements between States or District Boards or Governments, according to the terms under which concessions were given and the conditions under which the lines were financed and built. A number of railways have for some years been both owned and worked by the State, but in other instances they have been leased or re-leased to working companies for terms of years.

Thus, of a total of about 33,400 miles, some 8,000 are worked entirely by the State, about 18,000 by working companies, and the remainder under arrangements peculiar to each. Several of the company lines are, however, falling due to revert to the State, as in the case of the East Indian, whose 2,800 miles were handed back to the State at the end of last year, and the 3,300 miles of the Great Indian Peninsula, which go back at the end of June next. Of the principal lines already State-owned and worked the Eastern Bengal (2,000 miles), North Western (4,500 miles) and Oudh and Rohilkhand (1,650 miles) are the chief.



THIRD-CLASS CARRIAGES, BOMBAY, BARODA AND CENTRAL INDIA RAILWAY, 1860.

The first railway in India was the line from Bombay to Thana (G.I.P. Railway), opened April 18, 1853. The present company is a reconstruction of the old company, dating from 1900. The G.I.P. system provides, in conjunction with other

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railways, through routes from Bombay to Madras, Calcutta (two routes), Lucknow, Delhi, Poona, &c. The first section of the East Indian system was that from Howrah (Calcutta) to Hooghly, opened August 15, 1854. This was extended to Pandooah in the following year. By 1865 through routes had been completed from Calcutta to Delhi and, by means of the Allahabad–Jubbulpore line, to Bombay. A chord line from Sitarampur to Kieul, shortening the route to Delhi, was opened in 1870. Associated with the East Indian system are the Delhi–Umballa–Kalka, Jind–Painpat, and South Behar Railways. The old East Indian Company, formed in 1849, was purchased by the Government in 1879, and re-leased to the working company, whose contract has just expired without renewal. The chief main routes are those from Calcutta to Delhi and Bombay. Associated with the G.I.P. system is the old Indian Midland Railway, together with various local and light railways.

The Madras and Southern Mahratta Railway includes the old Madras Railway (1852) and the Southern Mahratta Railway, the latter being combined with other lines, together with portions transferred from the original South Indian Railway, when the present M. and S.M. Railway was constituted in 1907. The main routes are from Madras to Calcutta, Bombay and Upper India (broad gauge), though there is also a big system of metre gauge lines.

The Eastern Bengal State system was taken over by the Government in 1884, and includes the old Northern Bengal State and Calcutta and South Eastern lines. The earliest line was the Calcutta–Champabati section, opened January 2, 1862. The North Western State system was formed by the amalgamation of several local lines, and portions were constructed mainly for strategic purposes, particularly along the North Western Frontier. The opening in 1883 of the Attock Bridge completed communication from Calcutta to Peshawar, a distance of 1,555 miles. Important sections are those from Lahore to Delhi and the port of Karachi. The Oudh and Rohilkhand Railway includes the original company of that name. The first line built was opened in 1862.

In 1884 the first section of what is now the Bengal and North Western Railway was opened, but a part of the Tirhut Railway, worked as a portion of the system, had been brought into use ten years earlier. The B. and N.W. is, by the way, still worked more or less under the original conditions, and not under releasing contracts after purchase by the State, as in the case of most other companies.

The first section of the Bengal–Nagpur Railway was that from Raj-Naudgaon to Nagpur (1880–82). This was a metre-gauge line, the first broad-gauge section being that from Umaria to Katni, opened 1886. In conjunction with the Eastern Bengal, G.I.P. and other railways, the Bengal–Nagpur Railway is concerned in express services between Calcutta and Bombay and Madras and other centres.

The Bombay, Baroda and Central India Railway includes lines opened in 1860. It works several native State systems, and is remarkable for having a greater mileage of metre-gauge line (1,865) than of broad gauge (1,010 miles). The Burma Railways include the line from Rangoon to Prome, opened in 1877. The system includes the Burma Railways Extensions and Southern Shan States Railways.

The South Indian Railway includes both broad and narrow-gauge lines, the earliest having been opened in 1860. It serves a large area in South India and also provides connection with Ceylon, at present by steamers, but ultimately will do so by means of the Adams Bridge, which is being constructed across the intervening islets and shoals.

These are all the big Indian systems having a mileage of more than 1,000, but there are several smaller systems, notably the Assam–Bengal, Assam, Barsi Light, Bengal–Dooars, Rohilkund and Kumaon, and Southern Punjab Railways, besides the Jodhpur–Bikaner (1,402 miles) and smaller native State and other railways, such as the Bhavnagar, Darjeeling–Himalayan, Gondal, Gwalior Light, Junagad, Mysore State, and Nizam's Guaranteed State Railways. Some of these lines include sections opened in the 'seventies (Nizam's G.S. Railway, 1874) and 'eighties (Darjeeling–Himalayan Railway, 1881), but the majority, as also many parts of the larger systems, belong to the last twenty or thirty years.

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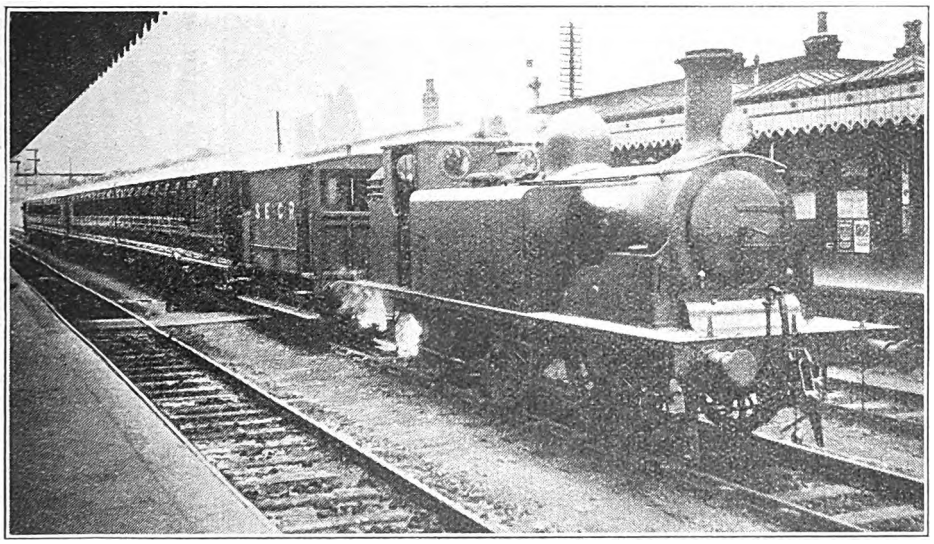
But while India accounts for so large a proportion of Asiatic railway mileage, there are vast areas outside it. Thus, in China there are thousands of miles of railway, though in proportion to area it is still very badly served, and the majority of the lines date since 1900. In Manchuria, Korea, Dutch East Indies, French Indo-China, Siam, Siberia, &c., there are now considerable mileages, but nearly all of comparatively recent date. Japan obtained its first railways comparatively lately, but now has, for its area, by far the best system to be found in Asia, apart from India.

The first railway in Ceylon dates from 1865, from Colombo to Ambepussa. The original sections of the Federated Malay States Railways date from 1885–86. Borneo obtained its first railway in 1900.

(*To be continued.*)

SOUTHERN RAILWAY (S.E. & C. SECTION) ELECTRIC ROLLING-STOCK.



We are indebted to Mr. O. J. Morris for the photograph reproduced showing a train of vehicles at Redhill which had arrived from Ashford and were on their way to be fitted with electrical gear, etc. They were being operated as a goods train. The Stroudly 0-4-2 tank engine No. 276, illustrated was just backing on to continue the journey southwards.

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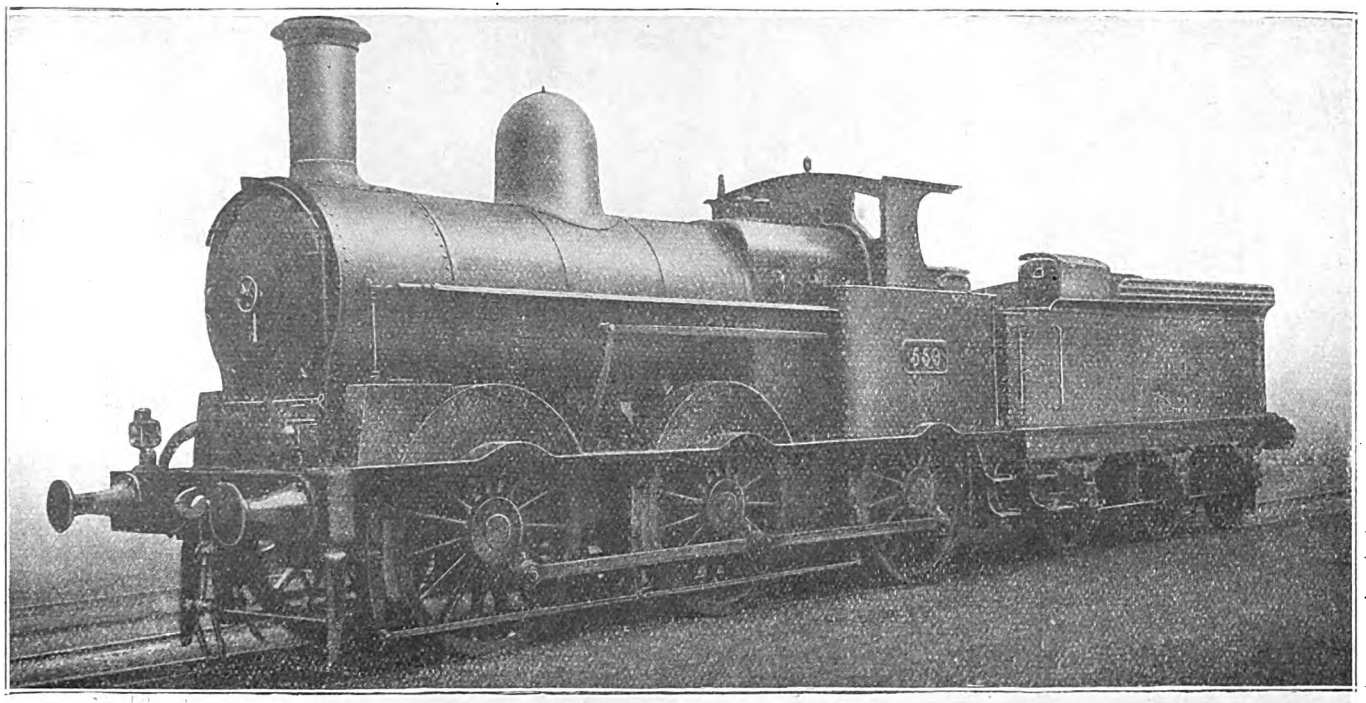
RE-BOILERING L.M.S.R. LOCOMOTIVES.



OLD L.N.W. LOCOMOTIVE FITTED WITH BELPAIRE BOILER.

ARRANGEMENTS have been made for the fitting of Belpaire boilers to four classes of Crewe-built locomotives, which hitherto have been equipped with fireboxes of the round-topped pattern. The photograph reproduced herewith shows one of the 0-6-0 type 18-in. goods engines fitted with a Belpaire boiler, and, as will be noted, two safety valves of the Ross patent "pop" type are mounted upon the firebox. This class has a non-superheater boiler, but the other three classes are equipped with superheating apparatus. The other engines to which Belpaire boilers will be fitted as required are the 0-8-0 coal engines, with 4 ft. 3 in. diameter wheels, the 4-6-0 "Prince of Wales" class, and 4-4-0 "George the Fifth" class.

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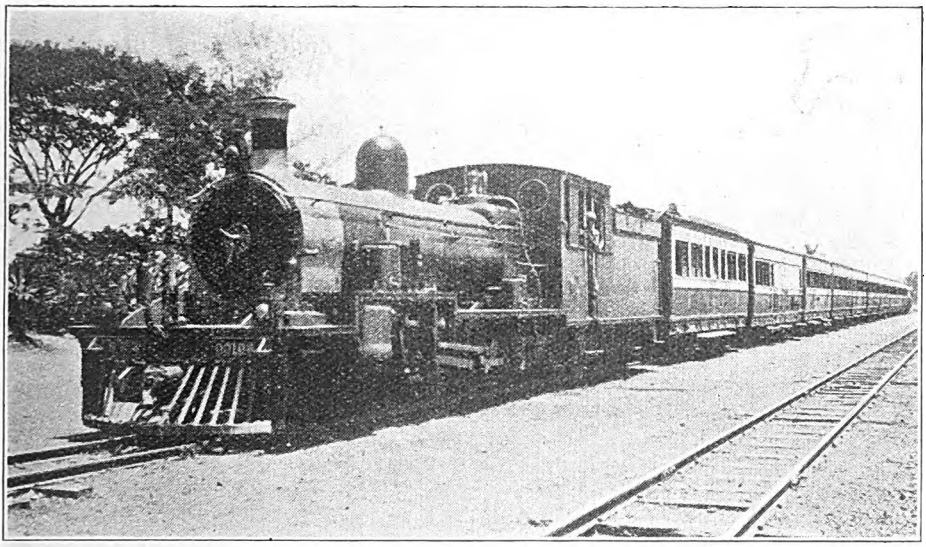

Photo.] EXPRESS AT RANCHI. [*B. D. Sullock.*

4-6-2 Locomotive No. 00105.

Narrow-Gauge Traffic on the Bengal-Nagpur Railway, India.

By B. D. SULLOCK.

A FAVOURITE spot for residents of Calcutta to spend a short holiday is Ranchi, the summer hill station for the Government of Bihar and Orissa, 2,000 ft. up and distant 273 miles from Calcutta. It is not a hill station in the same sense that Darjeeling is, being situated on a plateau and not on a mountain range like Darjeeling. In order to get to Ranchi one travels on the Bengal–Nagpur Railway. From Calcutta to Purulia (200 miles) one travels on the broad gauge (5 ft. 6 in.) and from Purulia to Ranchi (73 miles) on the narrow gauge (2 ft. 6 in.). The Ranchi Express leaves Howrah station, Calcutta, at 9.20 p.m. and, running at a slow rate of speed, reaches Khargpur, the locomotive headquarters of the Bengal–Nagpur Railway, at 12.15 a.m. Engines are changed here and Khargpur is left at 12.45 a.m. The main line is here left, and the train, running in a north-easterly direction, reaches Adra at 5.9 a.m. Adra is the centre of the Jherriah and Raneegunge coalfield district. A branch line runs from here to Asansol, on the main line of the East Indian Railway.

Leaving Adra at 5.32 a.m., Purulia is reached at 6.30 a.m. At the present time several new yards and sidings are being laid down at this part of the line with a view to the better working of the coal traffic, which is very heavy at all times of the year. The Bengal–Nagpur Railway is double track from Calcutta to Khargpur, single line from Khargpur to Bankura, on the Adra line, double track from Bankura to Adra, and single line from Adra to Purulia.

Nine hours for 200 miles does not represent a very high rate of speed, but the Ranchi Express is timed somewhat slowly so as not to arrive at Purulia too early in the morning. Engines of the 4-6-0 and 4-4-2 types work this express, and on the occasion of the writer's visit we had engine No. 408 (4-4-2) from Calcutta to Khargpur, and No. 427 (4-6-0) from Khargpur to Purulia. Breakfast is

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obtained at Purulia, and the narrow-gauge section of the run commences.

The narrow-gauge Bengal–Nagpur Railway engines on this section are of a very sturdy type, passenger engines being of the 4-6-2 type and goods engines of the 4-8-0 type, and are numbered in a separate series from the broad-gauge engines as they commence with 00; for example, our engine going up was No. 00103.

Express, omits several of the smaller stations. Water is taken at Jhalda (31 miles) and at Jonka (55 miles). Engine sheds are situated at Purulia and at Ranchi. There is a turntable at Purulia, but at Ranchi the engines turn by means of a triangle. Ranchi station has two running lines through it and is a typical example of an Indian light-railway station. Ranchi is the terminus of the

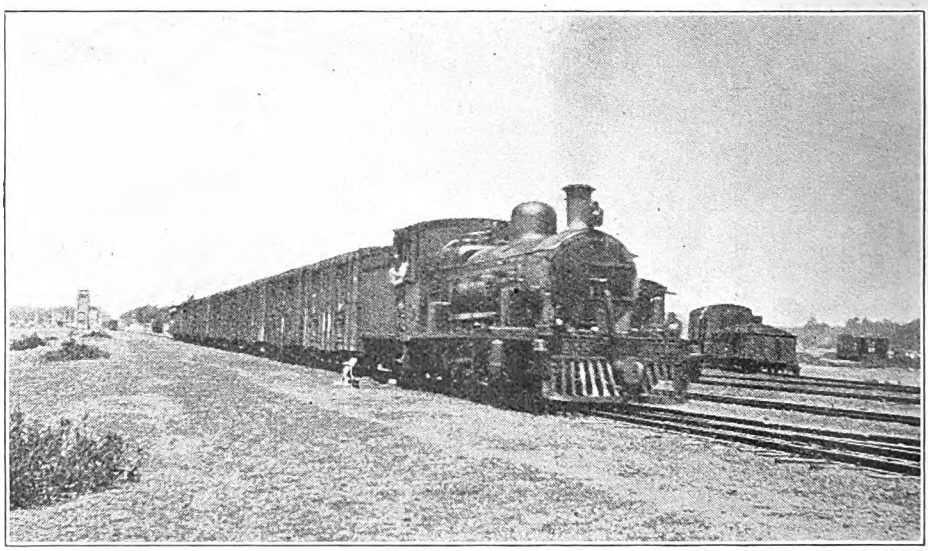


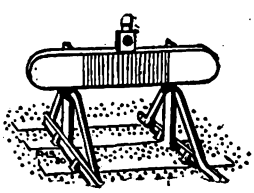
Photo.] **GOODS TRAIN LEAVING RANCHI.** [*B. D. Sullock.*

4–8–0 Locomotive No. 0065.

Like the broad-gauge train, the narrow-gauge train consisted of 10 coaches, though, of course, of a considerably smaller type. The narrow-gauge Ranchi Express takes 3 hours 49 minutes for the 73 miles from Purulia to Ranchi, and a fair rate of speed is attained at times, though on such a narrow gauge the running is inclined to be bumpy. Two passenger trains a day leave Purulia for Ranchi, one stopping at all stations, while the other, the Ranchi

Ranchi Express, but the branch line is continued to a place called Lohardaga, 43 miles farther on. One mixed train a day works over the extension.

In the hot weather the temperature at Ranchi is not much cooler than Calcutta by day, but the heat is a dry one. At night the temperature is, however, cooler. The Ranchi season is from October to January, when the station is crowded at holiday periods, and the climate is delightful.



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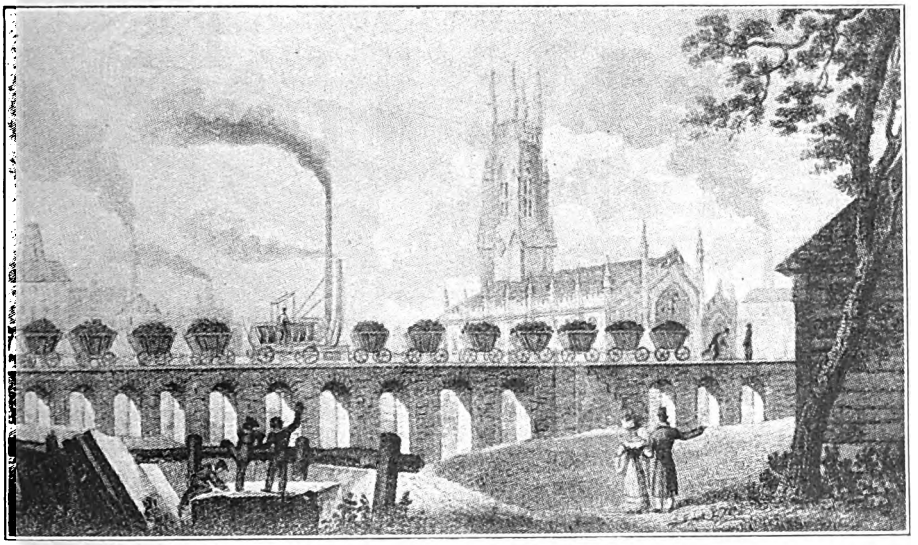
The First Rack Locomotive.



(*From an old print.*)

BY the courtesy of a Scarborough reader we are able to reproduce a photograph of a rare engraving, showing an uncommon type of locomotive built by Matthew Murray of Leeds, 113 years ago, for J. Blenkinsopp, under his patent of April 10, 1811. Blenkinsopp held the then common view that there was not sufficient adhesion between a smooth rail and a smooth driving wheel to enable the locomotive to draw a load; he therefore proposed that a toothed rail should be laid alongside the carrying rails, and that a toothed wheel on the engine should engage with this rack rail.

The boiler was cylindrical, with a single fire-tube terminating in a high chimney. The firebox was at the rear end, as in modern locomotives. The engine had two vertical cylinders, 8 in. diam., 20 in. stroke, placed partly within the boiler. Motion was conveyed by connecting rods to cranks on two shafts fixed below and at right angles to the frames. On each shaft was a small toothed wheel, which conveyed power to the centre toothed wheel, the latter engaging with the rack rail.

The engine is said to have weighed 5 tons, to have burned 75 lb. of coal per hour, and evaporated 50 gallons of water in the same time. It would haul 94 tons on the level at 3½ m.p.h., or 15 tons up an incline of 1 in 15. Its maximum speed was 10 m.p.h. It cost £400 to build, and was put to work on the Middleton Colliery Railway, near Leeds, 13¾ miles long, in August, 1812.

This engine was successful and continued to work for about twenty years. Two similar engines were supplied in 1813 by Murray to the Kenton Colliery.

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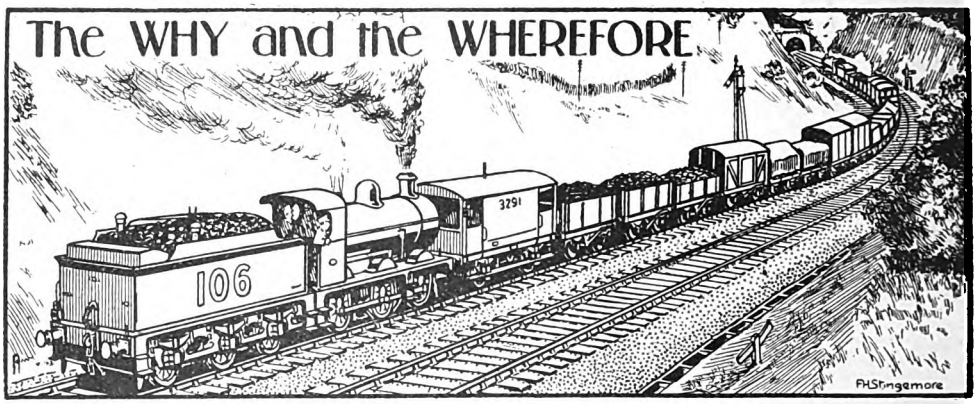

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications for information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, *33, Tothill Street, Westminster, London, S.W.1. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book" (5s. net) should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

Non-Stop Trains, Exeter–Plymouth, G.W.R.

Prior to the inauguration of the *Cornishman* on June 2, 1890—then the fastest train in the world—all trains made one or more stops between Exeter and Plymouth. The celebrated "single" tender engines hauled the fast trains over the level line between Exeter and Newton Abbot, whence a South Devon tank engine worked the trains westward to Plymouth, &c. Tank engines were employed on this section because they represented the hauling of less dead weight over the stiff gradients. The *Cornishman* introduced a considerably faster service between London, Plymouth and Cornwall, part of the saving in time being obtained by the elimination of stops between Exeter and Plymouth. The engines suitable for the line west of Newton Abbot were 2-4-0 side-tank locomotives, built in 1885, with 5-ft. 4-in. coupled wheels, but these could not carry sufficient water to make the non-stop run. Mr. Dean, then G.W.R. Locomotive Superintendent, therefore altered three of them and added tenders to them, and these were reserved for working the *Cornishman*. The engines of this type, although broad gauge, were built "convertible," and the three engines in question continued to run after conversion as narrow-gauge tender locomotives. We have no record of their numbers, but they may be those you mention—3502, 3505 and 3508. In more recent years the G.W.R. converted several tank engines to tender locomotives.

[Reply to B. Y. WILLIAMS.]

Connecting Greenwich Park and Maze Hill, S.R.

We have no information as to whether it is proposed to electrify the closed Nunhead–Greenwich Park branch of the S.E. and C. section. Although the line was opened to Blackheath in 1871, the extension to Greenwich was not opened until October, 1888, and was the last (except the Catford loop) addition to the L.C. and D.R. Nor have we any information that if it be electrified and re-opened a connecting line between Maze Hill and Greenwich Park sections will be constructed. The original idea of the L.C. and D.R. was to continue through Greenwich to Woolwich, but competing lines of the S.E.R. and agreements between the two companies prevented the proposal being carried out. Apart from these difficulties there was that of the Astronomer Royal, who maintained that vibration caused by trains in the tunnel adjacent to the Royal Observatory would so interfere

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with delicate astronomical instruments as to render them useless. This plea hindered the completion of the railway from Greenwich to Maze Hill for many years, causing the section between Maze Hill and Charlton Junction to be worked by a shuttle service from the opening of the Charlton–Maze Hill line in 1873 till 1878, when the connecting line to Greenwich was allowed to be constructed.

[Reply to C. E. BEAMES.]

Pullman Cars, S.R.

The statement made that Pullman cars were introduced on S.E. and C.R. Continental trains in 1910 is quite correct. The special trains mentioned were not made up of Pullman cars, although American vehicles were employed. Your further remarks are noted, though in some cases you are asking for meticulous exactitude, and in others the error, if there is one, is due to a mis-statement for which we are not responsible. On account of the technical weaknesses of artists responsible for many of the old railway pictures, notoriously incorrect impressions are given as to relative sizes, but that, if anything, rather adds to the interest of the views as presented to modern readers. Presumably our French correspondents knew what they were writing about, though it is possible that they were in error in certain minor respects, as you suggest. The reference to "Wainwright" engines on the Southern Railway was intended to indicate classes generally, and not in close detail. With that understanding our remarks are quite correct.

[Reply to H. D. HEWITT.]

S.R. (S.E. & C.) Locomotives.

4-4-0's Nos. 36 and 175 were originally of Mr. Wainwright's design, and were fitted experimentally with superheating apparatus, No. 36 having the Robinson design and, if we recall rightly, No. 175 the Schmidt. Both, we believe, have been rebuilt by Mr. Maunsell. The original South Eastern domeless locomotives were designed by the late Mr. James Stirling. Presumably the building and rebuilding plates you have noted apply to the particular engine. The firm mentioned built some of the class, but not all. The "676" class with side-window cabs were built to a Great North of Scotland Railway design, but delivered to the S.E. and C.R. The "516" class and similar engines were built some at Ashford and some by outside firms. We are glad to find that someone, at least, has a good word to say for Southern train services on the South Eastern and Chatham section.

[Reply to H. A. BRADBY.]

Dover-Calais Tidal Services.

The service between Dover and Calais became a fixed one in October, 1862, but for some years later, until improvements were carried out at Calais Harbour, passengers had to be embarked and landed at Calais by small boats when low water coincided with the hour of departure or arrival of the steamers. The trains of the S.E.R. commenced to run to and from the Admiralty Harbour, Dover, in 1859; those of the L.C. and D. Railway did not do so until some months after October, 1862. The L.C. and D. Railway, having acquired the cross-channel steamers, laid in a rail connection between the Harbour Station and the Admiralty Pier in October, 1862; but the Admiralty did not approve this line, and alterations had to be made to meet their views. These alterations took some time to arrange and carry out.

[Reply to R. H.]

Hammersmith and Great Western Joint Stock.

Mr. F. G. B. Atkinson sends further information as follows:—There are 40 three-car trains, the cars of which are identical in design with, though different in arrangement of seats from, the ordinary Metropolitan stock. These are the joint property of the Great Western and Metropolitan Railways. There are also four three-car trains of pure Metropolitan stock. The three cars of the same train all had the same number (until March, 1923). Thus the three carriages of the first train were Nos. 1, 1, 1, and of the last train Nos. 40, 40, 40. In March, 1923, the entire stock was renumbered on the Metropolitan system. The motors became Nos. 126–165, the trailers Nos. 11–50 and the control trailers Nos. 120–159.

[Further reply to "SOUTHERN E."]

Leicester and Swannington Railway.

The only railway connection the Desford–Leicester (West Bridge) section of the

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Leicester and Swannington Railway has with other lines is *via* Desford Junction. This sections remains a single line, with the original tunnel, but more modern permanent way, &c. There is now little traffic over the Desford–West Bridge section beyond the two daily passenger trains each way, the mineral and goods traffic having much declined. The northern section of the L. and S. Railway is not utilised as part of the through route to Burton. It is 1 m. 18 ch. in length, and connects at its northern extremity with the southern end of the old Coleorton tramway.

[Reply to H. A. WHITE.]

French Locomotives.

We have no information as to the 4-8-0 express locomotive described as for use on the Eastern Railway. In any case, it is hardly likely to be intended for hauling 800-ton express trains at a speed of 80 m.p.h. We have several times explained the marked boards noted by you on Belgian railways. They indicate the approach to places where speed restrictions are necessary. We do not understand your complaint as to non-reply to enquiries. It is very exceptionally that a query does not have attention, and we cannot call to mind any hitherto received from you.

[Reply to "INTERESTED."]

Number Boards on Locomotives.

Presumably, the boards you have noted carried by engines of Caledonian goods trains are used for identifying extra or special trains at times when considerable numbers of additional trains are run. The numbers or letters would, of course, be those used in the special instructions to the staff. Caledonian 4-4-0 engine No. 779, *Breadalbane*, is one of the "Dunalastair II" class. Several of these engines at one time bore names, though we have no information as to how many are now retained.

[Reply to S. WATSON.]

L.N.E.R. Electric Locomotive.

As there is no considerable length of line equipped for electric traction on the L.N.E.R., it has been possible only to test the 4-6-4 express locomotive on the Newport–Shildon section. A number of experiments have been made there, but we have no knowledge as to the results, though we do not attribute the apparent dropping of the proposal for electrification between York and Newcastle to any deficiency in regard to the locomotive.

[Reply to "SWISS OBSERVER."]

Engine Stations.

As you will see from the rules of this section, as also the statement at the head of "Locomotive Matters," space cannot be given for particulars of the sheds at which particular engines are stationed. Further, by the time information of this character could be published it would frequently happen that some of the engines mentioned had been transferred. Obviously it is not possible to publish particulars of this kind, as they are subject to continual change.

[Reply to W. J. BONE.]

Southern Railway Electrification.

We have no information as to contemplated through services on certain sections of the routes now in course of electrification, though, when completed, many developments will become practicable. That there may be interesting changes is rendered probable by the fact that, as you and other readers point out, a fourth rail is being laid on certain routes. Your kind remarks in regard to the RAILWAY MAGAZINE are appreciated.

[Reply to "SNOW HILL."]

L.N.E.R. Locomotives.

As the Hull and Barnsley Railway was taken over by the North Eastern Railway before the group amalgamation, its locomotives were already renumbered in the North Eastern series. Great North of Scotland locomotives are re-numbered with those of the Great Central series from 5,000 onwards. Locomotive development will receive due attention in our series of articles dealing with the Railway Centenary.

[Reply to "587 B."]

Bell Codes and Automatic Signalling.

The only automatic signals in this country similar to your sketch are between Alne and Thirsk on the North Eastern area. There the trains are only

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"belled" forward. There are, however, numerous cases of single intermediate automatic sections and there ordinary block working prevails. A paper on this subject appeared in the Proceedings for 1922 of the Institution of Railway Signal Engineers.

[Reply to "ASHPAN."]

Stratford Locomotives.

Mr. James Holden's "Decapod" locomotive was scrapped a few years after its conversion to a 0-8-0 goods locomotive. The last new locomotives constructed at Stratford Works were the "990" series of 0-6-2 tank engines. So far, it is doubtful whether any further new locomotives will be constructed there, though there will still remain plenty of work in the way of repairs and maintenance.

[Reply to "DECAPOD."]

Single Line Non-Crossing Stations.

Unless there is a level crossing to protect, or signals are required for other reasons, there is no real necessity for signals to be provided at non-crossing stations on single lines, as there can, of course, be only one train in the section, and so long as the driver has the tablet or staff therefor he has sole occupancy of the section. Presumably, the station you mention is one of that class.

[Reply to G. ELLIS.]

Scenic Railway Routes.

There are, of course, many ways in which the scenic characteristics on various routes could be classified. At the same time, while our various contributors have frequently commented upon the scenic attractions of particular journeys, it would hardly be desirable to invite comparisons in regard to matters which are so largely a question of personal opinion.

[Reply to R. D. JAMES.]

Shunting Signals.

Presumably the auxiliary signal shown on your sketch, as in use at New Wandsworth box, is a shunting, calling-on or repeating signal of the Sykes "banner" type. Otherwise, we are unable to explain further, except by study of the actual location. It is hardly likely to have any such indications as those you suggest.

[Reply to A. RANSON COWLISHAW.]

2-4-0 Locomotives, L.M.S.R.

The engine shown in the photograph reproduced on page 94 of the February, 1924, number is one of a numerous class to be found all over the Midland Division of the L.M.S.R. The class is, of course, an old-fashioned one, but the various engines still do a great deal of useful work on light duties and in piloting main-line trains.

[Reply to "CURIOUS."]

Southern Railway (S.E. & C.R.) Locomotives.

We have on a number of occasions explained that we cannot give particulars of the stations and duties of individual locomotives, although occasionally such information may be given incidentally in "Locomotive Matters." Neither can we forecast when new engines under construction will appear.

[Reply to J. G. S.]

North London Working at Acton.

North London 4-4-0 and 0-6-0 tank engines work regularly, as they did long before grouping, to Acton, G.W.R., from Willesden Junction, and presumably the locomotive you mention was one of the 4-4-0 class. Particulars have been given of re-numbering of L.N.E.R. locomotives more than once.

[Reply to L. BLACKMAN.]

Blocking Back.

"Blocking back" is required when a train enters upon or is backed on to a running road for fear it should be forgotten. This is not necessary when a converging line is fouled by a passing train at a junction, as the train continues moving. Were it brought to a stand "blocking back" would be necessary.

[Reply to A. C. PALMER.]

Head Codes.

Obviously the extra lamp bracket you have noted on L.N.E.R. locomotives of the G.N. section is to meet head-code requirements. We have no knowledge of any suggestions as to the use of "Brighton" express tank engines for Bournemouth or

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West of England expresses on the South Western section of the Southern Railway.

[Reply to "SOUTHERN."]

Electric Vans, Southern Railway.

We understand that several vans have been equipped as motor vehicles for use on "Brighton" section electric services, and are thus available not only for dealing with miscellaneous duties independently of passenger trains, but also to some extent as electric locomotives.

[Reply to A. RANSON COWLISHAW.]

L.M.S. (North Staffordshire) Locomotives.

Mr. J. A. Hookham was the last Locomotive Superintendent of the North Staffordshire Railway, and he was preceded by Mr. J. H. Adams and Mr. Luke Longbottom. If you had studied the design of Mr. F. W. Webb's three-cylinder compound passenger locomotives, you would have realised that it would have been impossible to couple the wheels without very considerable alterations.

[Reply to A. W. G. COPE.]

Power Signalling on the S.R.

Signalling between Woking and Basingstoke is on the British Pneumatic Railway Signal Company's system automatic unless the system is broken into to enable points to be worked at intermediate boxes. Your remarks *re* Southern Railway Pullman cars are noted.

[Reply to M. H. R. BORTON.]

Head Codes on Irish Railways.

Mr. J. Macartney Robbins explains that the standard system of head codes is in use on the main Irish railways, though it is not adhered to strictly in some cases, as on the Dublin and South Eastern, where local trains often carry two lamps on the buffer beam, thereby suggesting an express.

[Reply to S. T. C.]

G.N.S.R. Locomotives.

The works at Inverurie are, for their size, very well equipped, so that quite a number of the locomotives belonging to the Great North of Scotland section of the L.N.E.R. were built there. We are not able to reply to your enquiry as to Southern Railway steamers.

[Reply to J. MCINNES.]

Draining Railway Cuttings.

The patterns you have noted on the slopes of railway cuttings are, as you suggest, to facilitate drainage. A ready course for surface water between the stones which occupy the trenches thus laid out prevents the side of the cutting becoming waterlogged.

[Reply to G. E. BIGMORE.]

Gradients at Exeter.

From Queen Street Station down to the Great Western Railway at St. David's the gradient is at 1 in 37 for ½-mile. We do not understand your reference to passing home signals at danger; this is only authorised in very exceptional circumstances, and is in no case a regular practice.

[Reply to KEITH COOPER.]

Pullman Car Trains.

It is quite possible that there will be important developments in regard to the running of Pullman trains on British railways, though we have no definite information at present as to services such as those mentioned by you.

[Reply to "BRIGHTON CLERK."]

North British Locomotives, L.N.E.R.

Mr. C. Kollien mentions that, so far as he has been able to collect particulars, there are 96 engines bearing names, 74 of the 4-4-0 type and 22 of the "Atlantic" class. We cannot, however, spare space for a list.

[Reply to "WANDERING WILLIE."]

Woodford South Junction, L.N.E.R.

Referring back to a query published in 1922, Mr. W. E. Callam mentions that on page 496 of Vol. XIII of the RAILWAY MAGAZINE an illustration was reproduced showing a Great Central express approaching the South Junction at Woodford.

[Reply to R. KIRBY.]

Splitting "Distants."

Distant signals are not provided for running into loops or through crossover-junctions, because thereby, as you say, the train is slackened. That ensures that speed is reduced before entering upon the diverging route.

[Reply to "ASHPAN."]

L.M.S.R. 0-6-0 Tank Engines.

These engines belong to a series built more or less to Derby designs by different firms, but intended for use on various

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parts of the system, for which reason they are not allocated in the Midland Division series of numbers.

[Reply to "FURNESSIAN" and J. S. GREEN.]

L.N.E.R. Electric Restaurant Car Kitchens.

Nominal voltage at which the cooking is conducted is about 200. Current can be used up to 60 amperes, above which figure an automatic cut-out operates on all connections.

[Reply to "BOURREAU."]

L.N.E.R. Coat-of-Arms.

It is not the intention of the L.N.E.R. to place their coat-of-arms on the cabs of the express engines throughout their line; "Flying Scotsman" was so treated for Wembley Exhibition purposes only.

[Reply to "BOURREAU."]

L.B. and S.C.R. Tank Engines.

The reference to page 342 in Vol. LII of the RAILWAY MAGAZINE is, obviously, to 4-4-2 and not 4-4-0 tank engines. Duplicate locomotives are now denoted by 0 in front of the number.

[Reply to "GOLDERS GREEN."]

Lynton and Barnstaple Railway.

This railway was described generally in the May, 1917, number of the RAILWAY MAGAZINE; also in the issue for May, 1898. Both these numbers are, however, now out of print.

[Reply to "PALMERS GREEN."]

S.E. & C.R. Locomotives.

We are not aware that S.E. & C.R. section 0-6-0 locomotive No. 687, painted black and picked out with green lines, differs from corresponding engines as repainted.

[Reply to "BOAT EXPRESS."]

Non-stop Runs, London-Grantham.

Throughout the height of the summer season the 7.35 p.m. Highland express from King's Cross was divided, at 7.35 and 7.42 p.m., and this makes the extra run to which you refer.

[Reply to "STAFFORDSHIRE KNOT."]

2-4-2 Tank Engines, L.N.E.R.

The 2-4-2 tank engine of unusual design that you saw under repair at Stratford Works—No. 8313—is one of the Colne Valley Railway, now incorporated in the L.N.E.R.

[Reply to ROY S. PAGE.]

G.W.R. Tank Engines.

There are both inside and outside cylinder 2-6-2 tank engines. So far as we are aware, only those with inside cylinders were rebuilt from 0-6-0 tender engines.

[Reply to B. Y. WILLIAMS.]

G.W. Engine Sheds in South Wales.

See particulars given in the *Railway Year Book*. You may be able to identify the places by reference to the maps published in the *Railway Year Book*.

[Reply to J. C. P.]

Southern Railway Locomotives.

To answer your inquiry would entail the publication of long lists for which no space is available. Please note instructions at the head of this section.

[Reply to "ELMSWELL."]

"1400" Class Locomotives, L.M.S.R. (L. and Y. Section).

So far as we are aware, not any of this class have been superheated or rebuilt with any appreciable changes.

[Reply to R. HOGAN.]

Painting L.M.S.R. Locomotives.

We have no further information as to the suspension of painting locomotives at Crewe. The statement you refer to was possibly correct at the time.

[Reply to E. R. H.]

S.E. and C. History.

Mr. E. R. Wethersett directs our attention to an article on the Reading Branch by H. L. Hopwood, published in the February, 1918, issue.

[Further reply to "TADWORTH."]

Hagan's Locomotives.

Mr. D. R. Carling confirms that several locomotives of this type were operated on the Tasmanian Railways some fifteen or so years ago.

[Further reply to H. R.]

Improvements at Croydon.

We understand that various improvements are in contemplation here, but have

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no knowledge of any scheme for goods avoiding lines.

[Reply to "BATHONIAN."]

Metropolitan Railway Steam Locomotives.

Letters you have noted on the bunkers of Metropolitan steam locomotives indicate the class. We have no knowledge as to the class letter for the 2-6-4 tank engines which are now being prepared for service.

[Reply to "JANITOR."]

S.R. (S.E. & C.) Locomotives.

The weight of three-cylinder 2-6-0 locomotive No. 822 is, we believe, 102 tons in working order and not 115¾ tons, as stated on the plate.

[Reply to H. R. URIDGE.]

"Pacific" Locomotives, L.N.E.R.

There are, or shortly will be, 57 4-6-2 engines in service on this railway, 52 of the Great Northern and 5 of the North Eastern type.

[Reply to "CAOUTCHOUC."]

Heaviest Locomotive in the World.

So far as we can call to mind, the "Triplex" engines used on the Erie Railroad, U.S.A., still rank as the heaviest in the world.

[Reply to T. W. LINSELL.]

L.S.W. 4-2-2-0 Engines, Southern Railway.

These four-cylinder engines, with uncoupled driving wheels, numbered 369–373 inclusive and 720, are still at work.

[Reply to A. E. M.]

Portsmouth Trains, S.R.

We are obliged for your notes as to head codes of these trains according to route. Your further suggestion is noted.

[Reply to J. D. THOMSON.]

55 m.p.h.

We will bear in mind your suggestion for a detailed analysis of all express trains averaging over 55 m.p.h.

[Reply to the Rev. R. P. DEVAS.]

Cambrian Railways Locomotives.

Prior to amalgamation the Cambrian Railways possessed six 2-4-0 tender engines.

[Reply to H. ROBINSON.]

Locomotive Numbers.

We cannot undertake to give long lists of locomotive numbers. See rules at the head of these pages.

[Reply to R. ABBOTT.]

Late Midland Railway Rolling-stock.

We are unable to supply the information desired.

[Reply to "ALBANIAN."]

King's Norton Station, L.M.S.R.

We have no information as to improvements and alterations proposed at this station.

[Reply to K. NEWMAN.]

Caulking Locomotive Boilers.

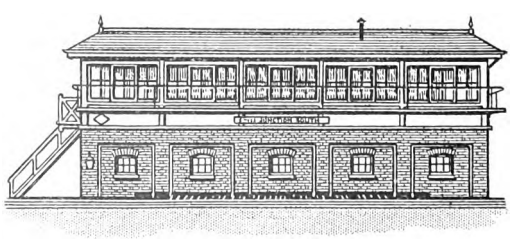
Various compounds are used for this purpose, but asbestos lagging is the usual covering.

[Reply to R. PUTNAM.]

"Caerphilly Castle."

The little book under the above title is obtainable at any Great Western bookstall, price 1s.

[Reply to "ADMIRER."]



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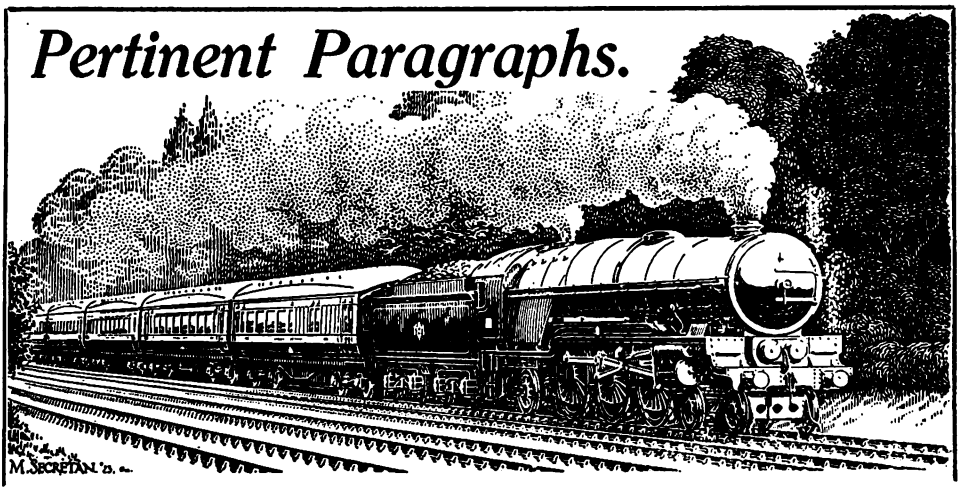
Pertinent Paragraphs.



Lord Claud Hamilton.

A GREAT personality in the railway world passed away in Lord Claud Hamilton, who died in January in his 82nd year. His was a varied and active life, including service in the Grenadier Guards, a long though rather intermittent experience of the House of Commons, and his thirty years' tenure of the Chairmanship of the Great Eastern Railway, which only ended when that undertaking became merged at the beginning of 1923 in the London and North Eastern Railway Company. It was in his capacity as railway Chairman that he was, perhaps, best known to the world in general. Lord Claud Hamilton, until his selection of Sir Henry Thornton as General Manager of the Great Eastern Railway in 1914, gave to the Chairmanship of that company rather more of the characteristics of a managing directorship than had been usual in British practice. At the same time, the general managers who had served under him before 1914 were by no means ciphers, or treated as such. Once he had made up his mind on any subject it was with difficulty that he could bring himself to change it. On this trait in his character an interesting comment is made by his biographer in *The Times*, who says that those who collaborated with him in business learnt that it was important to communicate their views to him before he had had time to form a view of his own. From the time he joined the board, in 1872, he took a particular interest in the Continental traffic, which under his direct encouragement has been brought to a high state of excellence. He was also mainly responsible for the success of the Hotels Department, which he took away from private hands and put under the sole management of the company, making the change with tact and efficiency. Lord Claud Hamilton soon proved himself to be entirely right in his selection of Sir Henry Thornton, although the appointment gave rise at first to some adverse comment on his supposed depreciation of British railway talent. Events have also justified his advocacy many years ago of the purchase of the London, Tilbury and Southend Railway, though he was unable to persuade his colleagues to adopt his views. Autocratic he may have seemed to be, an impression based on his military bearing and his somewhat derisive manner, but he was always courteous, and his own staff quickly learned to appreciate his real good-heartedness.

Rail Development.

IN view of the Railway Centenary Celebrations this year, a few particulars about the evolution of rails have been collected by the L.N.E.R. as follows :—

Wooden rails were used for horse-drawn traffic 250 years ago, but iron rails came into general use when George Stephenson laid down the Stockton and Darlington Railway, the first passenger railway in the world, which was opened for traffic in September, 1825. The rails were 15 ft. long, and had upper flanges 2¼ in. wide and weighed about 25 lb. per yard. A heavier pattern was used in 1829 for the Liverpool and Manchester Railway, the upper flange was 2¼ in. wide, whilst the rails were 2½ in. deep at the ends and 3½ in. in the centre. Double-headed wrought-iron rails were used in 1842, being 15 ft. in length and weighing 68 lb. per yard, and being secured in chairs by wooden keys much in the same way as at present. An interesting reference to these keys is made in the Rule Book of the Stockton and Hartlepool Railway, 1841, which tells us that " Every platelayer to pay a fine of 2s. 6d. for each key along his length which should be found out, and a like amount

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to be paid by every engine driver for stopping at any beer-house on the line."

In 1835 Joseph Locke introduced a type of double-headed rail, but on account of its inherent defects the present bull-headed type was gradually evolved, and its acknowledged superiority soon resulted in universal adoption. In 1875 a bull-headed rail 24 ft. long, weighing 83 lb. per yard, was introduced, which was followed in 1896 by rails weighing just over 100 lb. The modern rails used on the main lines of the L.N.E.R. at the present time are all of steel, 45 ft. and 60 ft. long, and weigh 95 lb. per yard.

Testing Wheel Tyres.

On the invitation of the L.M.S.R., a number of press representatives went to Horwich Works in order to see for themselves not only the methods by which tyres for locomotive and rolling-stock wheels are manufactured, but also the extremely severe tests to which they are subjected before they are allowed to be issued for service. In selecting the Horwich Works it was possible to follow the processes from steel manufacture to the finished product, Horwich and Crewe being the only two big railway works where the actual manufacture of steel is carried out. A cast of 20 tons of steel is sufficient for from 30 to 50 tyres, according to size, and one of these, selected at haphazard, is tested to destruction. As thus tested, the tyre has to deform to a calculated extent without sign of fracture, under the impact of a 1-ton tup falling unchecked upon it from heights of 10 ft., 15 ft. and 25 ft. It has also to satisfy physical and chemical tests. Should a selected tyre fail to pass all tests, two others are similarly tested to destruction, and if either of these fail in any respect, all tyres made from that particular cast are scrapped. It was easy to understand the point raised by Mr. George Hughes, Chief Mechanical and Electrical Engineer, L.M.S.R., that, in view of the fact that some 8,000 locomotives and many times that number of passenger and freight vehicles are in service every day on the L.M.S.R. alone, even a total of 18 tyre failures in the course of twelve months involves a practically infinitesimal risk.

A Forgotten Light Engine.

Major Hall's report on the collision, which occurred at 7.10 a.m., on October 14, at Hammerton Street Junction, Bradford, L.N.E.R., has been issued. The collision was between a passenger train and a light engine, the latter being at the time at a stand on the up main line, waiting to back into the loco shed roads. The passenger train was running at a speed of about 30 miles an hour under clear signals, on the up main line, when it came into collision with the standing engine. As a result of the accident, the driver and fireman of the passenger train engine were injured. There was only one passenger in the train at the time, who subsequently complained of shock. Both engines were damaged, the passenger train engine somewhat seriously. The damage to the light engine was not so severe. One of the two coaches forming the front twin set of the passenger train was somewhat extensively damaged. The train consisted of two 2-coach twin articulated sets, each having 12 wheels, and one 6-wheeled coach in rear. It was drawn by tank engine No. 1540, 4-4-2 type, running bunker first. The light engine was No. 4030, 0-6-0 type. The immediate cause of this collision was the fact that the presence of the light engine was overlooked in the fog prevailing at the time by the signalman at the junction box, when he allowed the passenger train to pass. The question of the application of Rule 55 was, however, involved, and the enginemen of the light engine are blamed for not having seen to its observance more quickly, the fireman not arriving at the signal box, although it was little over 100 yards from the engine, until about ten minutes after it had come to a stand. The driver is, therefore, chiefly blamed for this accident, though the signalman concerned—a man of excellent record and long service—is also attributed with a lesser degree of responsibility. He could only account for his lapse of memory by the "considerable pressure of work" and the foggy weather, but he unfortunately omitted to safeguard himself by the use of a lever collar as he should have done, and he is, therefore, more to blame than would otherwise have been the case. Obviously, neither of the enginemen of the on-coming passenger train had any chance of avoiding the collision, of which they had no preliminary warning, and which was inevitable in the circumstances.

In conjunction with a suggestion that track circuiting would have been justified at this location for reasons extending beyond the circumstances of the accident, the inspector states that the following lessons are to be learnt from this case :—

(1) The necessity for signalmen to make use of mechanical appliances, for example, lever collars, and not to rely upon their memory to safeguard the occupation of a main line.

(2) The importance of prompt compliance with General Regulations 55.

L.M.S. and G.W. Joint Lines.

Writing in regard to remarks in the February number as to traffic working on

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the Shrewsbury and Hereford Joint line, Mr. W. H. Dicken writes as follows: "In the case of the Chester and Birkenhead Joint line no alternate working of G.W. and L.M.S. locomotives on the same train, as remarked by Mr. Preece on the Shrewsbury-Hereford section, has ever been noticed, neither are the engines of either company mainly confined to either passenger or goods working. The traffic is large and both G.W. and L.N.W. locomotives of most of the existing types are very plentiful, though none larger than a 'Mogul' in the former case and a 'Prince' in the latter are seen as a rule. Most of the coaching stock is Great Western, the bulk of the main line through traffic belonging to this company. The G.W. through trains reverse at Chester, however, and are consequently worked on the joint line by 'local' engines of both companies. One sees habitually typical Great Western expresses in the inglorious charge of small tank engines. The Helsby and West Kirby branches are usually worked by L.N.W. 2-4-2 and G.W. 0-4-2, 2-4-0 and 0-6-0 tank engines, and a Rock Ferry-Hooton local service is maintained by a G.W. rail motor. Some of the local trains present a very heterogeneous aspect. An L.M.S. goods train was recently seen at Birkenhead in charge of 0-6-0 No. 17627, presumably an ex-G. and S.W. engine. Some of the early 'Jumbos,' such as *Penrith Beacon* (now No. 5069, new livery) and *Marquis Douro* are frequent L.M.S. visitors."

L.N.E.R. Musical Society.

THE London and North Eastern Railway Musical Society held the second Bohemian concert of the 1924-25 Session on February 3 in the Hamilton Hall, Liverpool Street Station Hotel, the chair being occupied by Mrs. Geoffrey Marshall, wife of the Goods Manager of the Southern Area. Before the concert started, Mr. A. W. Headley, Hon. General Secretary to the Society, explained that for the first time in the history of the Society, Colonel Wm. Johnson Galloway, Hon. Conductor throughout since the Society was established in December, 1908, was unable to be present under doctor's orders. This was in itself a matter for universal regret, in that Colonel Galloway had achieved somewhat of a record in having been present at, and had partially or wholly conducted, no fewer than 126 of the Society's concerts—over 60 in the Hamilton Hall. The performance was conducted by Messrs. E. R, Wilby, E. Cruft, and P. E. Gayer. As usual, a splendid programme was provided, orchestral items including several of an advanced character and entailing heavy demands upon the executive capabilities of the orchestra. They were rendered in splendid style, and attracted wide appreciation from the large audience. The orchestra also accompanied Miss Rene Maxwell, who gave a fine rendering of the "Caro Nome" aria from "Rigoletto" (Verdi), together with Liszt's "Hungarian Fantasia" for pianoforte and orchestra, the solo part of which was splendidly played by Miss Marie Novello. Miss Rene Maxwell, together with the contralto soloist, Miss Stella Murray, were concerned in other selections with pianoforte accompaniment, while Miss Marie Novello rendered pianoforte soli in the second part. All these artistes received well-deserved encores. Mr. Sydney Harrington, F.R.C.O., served as accompanist as usual.

During the proceedings Sir R. L. Wedgwood, C.M.G., Chief General Manager, proposed a vote of thanks to Mrs. Marshall, who was presented with a silver and ivory mallet, suitably inscribed. Mr. W. G. P. Maclure, Locomotive Running Superintendent, Southern Area, seconded the vote of thanks, which was enthusiastically rendered. Replying on behalf of his wife, Mr. Marshall thanked Sir Ralph Wedgwood and Mr. Maclure for their kind remarks, expressing his own and his wife's appreciation of the concert as a whole, also referring to their regret at Colonel Galloway's absence.

Railway Companies' Claims for Wage Reductions.

THE National Union of Railwaymen and the Railway Clerks' Association having recently submitted to the railway companies a programme for an all-round increase in wages and salaries and a general improvement in other conditions of service, the general managers of the railway companies, after giving careful consideration to the applications, met representatives of the trade unions on February 3 for the purpose of discussing the whole position. As a result of the meeting the general managers informed the trade unions that the companies could not agree to an increase in present rates of pay or an improvement in conditions of service involving increased costs. On the contrary, the railway companies have come to the conclusion that in existing circumstances they have no alternative but to press for a reduction of the present labour costs of the railways, and they submitted details of their proposals to the trade unions.

Before the war the total wage bill of the railway companies amounted to £47,000,000 per annum. At the present time the railway wage bill, including the wages of the additional staff employed as a result of the reduction of hours granted during the period of Government control, is at the rate of

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£120,000,000 per annum, or two and a half times the pre-war total, an increase of 155 per cent. The average rate of pay of railwaymen is approximately 115 per cent. over pre-war. The average increase applicable to all industries is from 70 to 75 per cent.

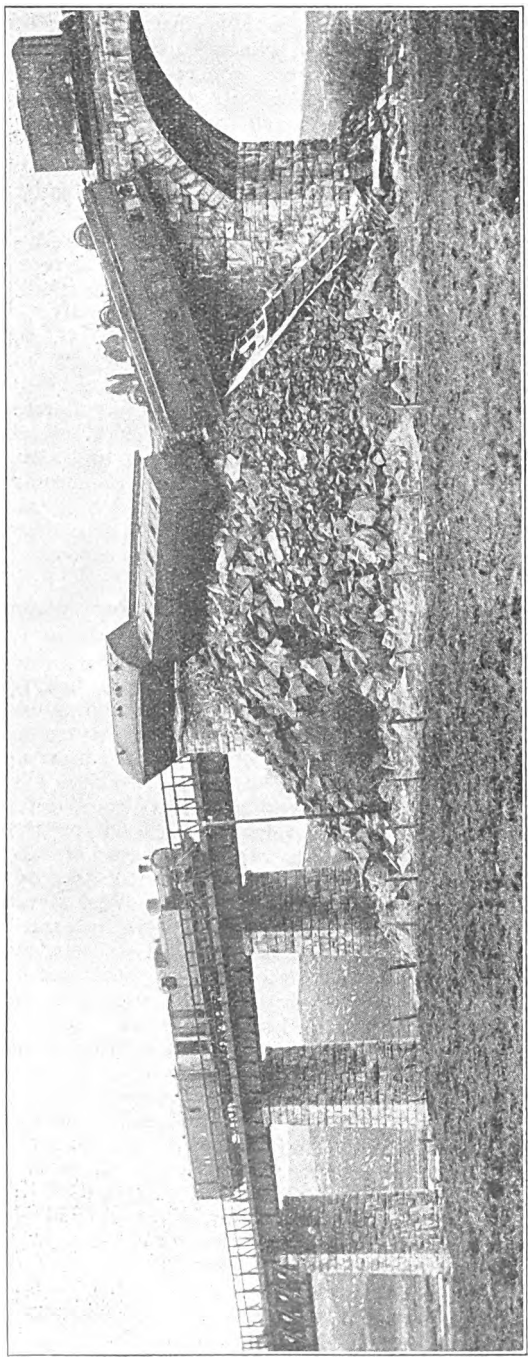

Photo.] FATAL ACCIDENT ON OWENCARROW VIADUCT, LETTERKENNY & BURTONPORT LINE, IRELAND. [Topical.

The programme which had been submitted by the trade unions is estimated to cost a further £45,000,000 per annum. If these demands were granted, it would bring the increase in the railway wage bill up to 250 per cent. above pre-war. The railway companies are not in a position to make concessions on wages or conditions of service. Instead, they applied for reductions as follows:—

Conciliation Grades, Docks Staff, and other Railway Employees coming under Conciliation Conditions.

Immediate flat-rate reductions in base and current rates of 6s. per week in rural areas and 4s. per week in London and industrial areas, the existing cost of living sliding-scale arrangement to be retained.

Salaried, Clerical and Supervisory Staff.

That no alteration should be made in the scales of pay, except that the adult age for clerical staff (male and female) should be raised from 18 to 20, and that junior male clerks should not be advanced to the Class V scale until there is a Class V vacancy and they have passed the appropriate examinations.

Train Blown over Viaduct.

A PASSENGER train from Londonderry to Burtonport, on the Burtonport extension of the Londonderry and Lough Swilly Railway, was blown over on January 30 when crossing Owencarrow Viaduct, between Kilmacrenan and Creeslough. One vehicle was blown off the rails and pulled another over with it, though, as the couplings held, neither fell to the bottom of the ravine, although roof destruction caused several of the passengers to be thrown into the valley beneath, three being killed outright, while a fourth died later in Letterkenny Hospital. Others were more or less seriously injured. Whilst this terrible disaster is not without parallel as to cause and effect, no similar accident has been as serious. In November, 1898, a train on the Tralee and Dingle was derailed in a gale and one passenger killed, and in the following January there were two cases, on the same day, on the West Clare. The derailment of the whole of the ten vehicles of the down mail on Leven Viaduct, Furness Railway, on February 27,

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1903, was more serious still, but, fortunately, there were no fatalities in that case. The disaster on January 30 was on Owencarrow Viaduct, between Kilmacrenan and Creeslough, which is 380 yards long and 30 ft. high. The country there is very wild and, if we remember aright, the line at that point runs due north and south, so that the train would get, on its side, the full force of any westerly gale.

"Through the Mountains of British Columbia on a Locomotive."

WITH regard to the article under this title, published in the December number, Mr. K. M. Willis-Harris, writing from Calgary, Alberta, remarks as follows :—

"Regarding the locomotives of the 5000 class (*i.e.*, the P.1 class) the percentage rating is 210 and not 275, as your contributor states. Of course the size of the wheels given is a misprint—it should read 63 in. diameter (not circumference). Further, the total weight of these engines is 258,000 lb., whilst the weight on drivers is 197,300 lb. The P.1 class of engines, of which the C.P.R. have 95, are of the 'Mikado' type 2-8-2 with 23½-in. by 32-in. cylinders. I presume that Sir Charles Pier, Bart., was given the data for the P.2 class, or 5300 series, of which type 60 are in operation (although these are not oil-burners as mentioned by him). These are likewise 'Mikado's,' with the same size drivers as the P.1, but the weight on drivers is 235,000 lb.; total weight, 320,500 lb.; 25½-in. by 32-in. cylinders, and a percentage rating of 275 per cent.

"It may be of interest to your readers to know what the per cent. rating is. The C.P.R. capacity rating is 20,000 lb. for 100 per cent. or 200 lb. for 1 per cent. This is shown on identification plate on both sides of the boiler, near the front end. This plate also states which class engine belongs to and date built. From this it is seen at once that the tractive effort for P.1 class of 210 per cent. is 210 by 200 = 42,000 lb. and for P.2 class 275 per cent. = 55,000 lb. The engine 2316, photo of which you give, is a G3c, having 25-in. by 30-in. cylinders, 210 per cent. weight on drivers, 181,500 lb., and a total weight of 300,500 lb., the size of drivers 75 in. During the past week the temperature dropped to 45 degrees below zero, which, as you can readily understand, is hard on any engine."

Express (?) Work in India.

IN view of the emphasis which is laid upon fast schedules of through express trains, it is interesting to find that ideas, both as to speeds and as to punctuality, vary in different parts of the world. One of our Indian readers refers to the timing of the Assam–Bengal mail train from Chandpur to Juri, which is allowed 8¼ hours for the distance of 164 miles. Obviously, it is a route where high speeds can hardly be maintained and one liable to many delaying influences. At the same time, so far as one can gather, it is quite an easy timing, after allowing for all complicating factors. Nevertheless, our correspondent mentions that on going to meet the train at Juri, he found it booked to arrive 2 hours 10 minutes late. "I was informed by the native stationmaster that this is usual at this time of the year, as the signalmen go to sleep to escape the cold and thereby delay the trains. Considering that this is the mail on the main line, and that there are only eight trains per day, it is rather amusing. The track though poorish has not many bad gradients."

Railways in the Netherland East Indies.

THE financial position in the Dutch East Indies has restricted development of the railway system during recent years, but in the current budget, provision is made for a new line. This is to be 17½ miles long and connect Garoet with Tjikadjang; it is estimated to cost £231,333; the traffic resulting from the line is expected to be sufficient to pay 6 per cent. per annum interest on cost, after allowing 2 per cent. per annum for depreciation. Three additional extensions of a total length of 67½ miles were discussed in the People's Council last June, the estimated cost being £1,346,000, but as appropriations were not granted, no start can be made till 1926, and, moreover, a commencement that year is dependent upon the State making the necessary financial arrangement during 1925.

The branch railway in South Sumatra from Moedra Enim, which was completed to Lahat in May, 1924, is to be continued to Benkoelen. Another line in South Sumatra from Batoer-adja to Martapoera is expected to be finished by the end of 1924.

The Java State Railways have received from Europe 10 locomotives of the "Mallet" type; these differ from the "Mallet" engines received from U.S.A. in 1921 in having plate frames in place of the American bar frames. During 1923 the gross receipts of the Java State Railways were £4,998,688, a decrease of £424,454 compared with 1922. Good progress has been made with the construction of an electric railway between Meester Cornelis and Tandjong Priok. It is expected this line will be opened at the end of 1924. The hydro generating station at Oebroeg, on the Tjitjarih River, was, according to the Report on the Economic Situation of the Netherland East Indies to July, 1924,

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recently issued by the Department of Overseas Trade, then almost completed, and the high-tension line approaching completion; the 78-ft. masts to carry the wires were received from the Rhein Elbe Union, the switch plant from Germany, and the transformers from Holland. The Oebroeg generating station is of 70,000 h.p. Proposals to electrify two important sections of existing railways are under consideration.

From July 1, 1924, the Java State Railways were divided into two divisions—the East and West—practically independent of each other, but presumably responsible to the Director of Government Services. Negotiations have taken place between the State and the Netherland Indies Railway Company regarding the construction of a railway from Djocja to Solo, to cost £708,000. The construction of this line would obviate the traffic delays on the section of railway common to the State Railways and the N.I.R., and would allow for a one-day service between Sourabaya and Batavia. The State Railways are negotiating to take over, as from January 1, 1926, the narrow-gauge railway system of the Semarang-Cheribon Steam Tramway Company.

Express Trains on French Railways.

COMMENTING upon the claim made in a recent issue of the RAILWAY MAGAZINE, that the Gare de Lyon, Paris, has a record for the number of long-distance expresses leaving during the three hours from 19.30 to 22.30, Mr. Paul Constant, writing from Lyons, suggests that Dijon, if not equalling that record, must run it very close. He points out that in the course of 5 hr. 55 min. 29 long-distance expresses are dealt with. One of these terminates at Dijon. In the case of the other 28 the average time spent in the station is about 11½ min., the longest being 32 min. and the shortest 7 min. Mr. Constant sends a detailed list of these trains, and suggests that a night spent at Dijon would not be wanting in interest. So far as vehicles are concerned, coaches are included belonging to the P.L.M., Nord and Eastern Railways of France, the Swiss Federal and Loetschberg Railways, and the Italian State system, to say nothing of the various sleeping, dining and through cars. A further point he mentions is that several of the expresses have attached to the rear an old dismantled locomotive utilised for heating purposes. About 98 per cent. of the P.L.M. "Rapides" are, of course, worked by "Pacifics."

Notes on French Railways.

MR. C. B. FARRAR and other readers point out that the 2-8-2 locomotive illustrated on page 96 of the February number belongs to the Etat system, and not to the P.L.M., as stated on the authority of the photographer. Mr. Farrar also sends some remarks as follows: "It may be of interest to know that the Chemin de fer de l'Est have just produced, from their Epernay Works, what they claim is the premier locomotive in Europe, combining speed and power. The 'Superpacifique,' as it is called, No. 41001, is a 4-8-2 tender engine, and, judging by the one and very bad newspaper photograph I have yet seen, it would make the Great Northern 'Pacific' look small. The engine is expected to haul the heaviest trains at an even speed over any main line of the Est system—no easy feat! The only dimensions I can so far obtain are—coupled wheels 1·95 m., and an overall length of engine alone (I presume) 23·30 m. The tender can take 32 cubic metres of water and 10,000 km. of fuel—sufficient for the run from Paris to Nancy—there being no troughs on the French railways with one exception, on the Etat An interesting exhibition was held at the Gare de l'Est, in Paris. No. 41001 was drawn up at the same platform with one of the 'Pacifics,' Etat type, representing locomotive progress in 1919, a 4-6-0 engine of 1912, an express engine of 1892, and, lastly, one of the famous old 'Crampton' singles of 1852, of which latter it is said that it could obtain the same speed as No. 41001 but would not even be able to move the trains that the 'Superpacifique' is expected to haul at 75 m.p.h. It is curious that this company should have produced the 'Superpacifique,' for the Est is the only French railway that has not built the 'Pacific.' All the other railways have used 'Pacifics' since even pre-war days. The Est have, it is true, several of the standard Etat-type 'Pacific,' but I do not think these were turned out at Epernay—at least, they are not Est pattern—and they have not long been used. The bulk of fast trains on the Est are still hauled by the admirable 4-6-0's, which do excellent work on heavy trains, and the Est, after the Nord, is a very stiffly timed railway, well on a level with British standards."

A Trip on the "Petite Ceinture."

MR. J. E. N. HEYGATE, writing from Oxford, sends particulars of a trip on the "Petite Ceinture," in which he raises several matters of interest. He writes as follows:—"I imagine that few people have deliberately travelled on the 'Petite Ceinture' for their own amusement—perhaps fewer for purposes of business. My request, consequently, for a first return from and to Auteuil at Point du Jour caused no small

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surprise to the station staff, which numbered two in all. The complete circuit from point to point, including changes, took 2 hours 41 minutes, the first-class fare being 2 francs 50 centimes. The line from Auteuil-Boulogne to Pont Cardinet, on the main line from Saint Lazare, does not form part of the Ceinture proper, but is owned and run by the State Railway; proceeding clockwise from the Point du Jour, it was therefore necessary to change at Boulogne-Auteuil, which is a two-way terminus, and at Courcelles to pick up the Ceinture again. The trains on the Ceinture run about every half-hour, and, so far as I could understand, on the connecting portion every 40 minutes, so that a maximum wait of over half an hour was possible either at Boulogne-Auteuil or Courcelles—in my case at the former. The line, by the way, from Avenue Henri Martin to Champ de Mars is at present closed. There is not much to see in the course of this lengthy journey except the 'fortifications,' which the track follows for the great part of the way, and which are now being demolished to give way to additional building space and to vast abattoirs on the north-east of Paris. Two passengers entered my compartment during the afternoon, and, on an average, half a dozen for the whole train at each halt. The running time, I suppose, was something under two hours, an average of roughly 15 miles per hour, and I could without doubt have made the circuit in the same time on a cycle. On my arrival once more at the Point du Jour, I was given a most gratifying reception by the combined Chef de gare-Percepteur-Porteur, which went far to atone for a wasted afternoon."

The Art of Making Railway Fares.

THE fixing of railway fares is not quite so simple a matter as it may seem to be. When there is only one route between two places, the mileage and statutory scale govern the charges, but even in such cases the big development of motor 'buses in recent years has in most districts complicated the simple problem. When there is a second route between two series of stations, and one route is considerably shorter than the other, the art of the fare builder is called into use to arrange a scale of fares that, whilst not reducing unduly fares to intermediate places not affected by the alternative route, so equalises fares, that those to intermediate stations do not exceed those to the further-off places where fares are governed by the shortest route.

In several cases, by making a later and shorter line than the earlier one owned by the company, railways suffer a reduction of fares not forced upon them by competition. Between some stations with alternative routes on the same railway, different fares are in operation, based chiefly on mileage. Mileage fares by the longer route are presumably retained to avoid reducing fares to intermediate stations not affected by the short route. In a general way these different fares lead to confusion and irritation, and, where possible, should be abrogated provided the intermediate fares can be safeguarded.

Much Mileage for Little Work.

FARES to many places on a circuitous route are based on the fares of the shorter route. But the distance is so much farther that passengers rarely make use of them, and if a ticket is asked for, the booking clerk usually suggests the shorter although competing route. The route to Reading by the South Eastern and Chatham section of the Southern Railway gives an interesting example of straightforward fares for intermediate stations. The fares between London and Reading are governed by the Great Western Railway route of 36 miles, the distance by the South Eastern and Chatham section being 68¾ miles. The latter route first meets competition at Dorking, to which the Brighton* Railway has the shorter route, and the fare by the South Eastern and Chatham Railway is the same; to Gomshall, 5½ miles farther, the fare is raised 8d. To Chilworth, 39¼ miles, 3 miles before Guildford, the London to Guildford fare of the London and South Western Railway* is adopted, and until the grouping this fare was the same for eight successive stations, although 16 miles separate the first and last of the group. Here comes a peculiar feature. The London and South Western Railway has much shorter routes to Wanborough, North Camp and Farnborough, and from these stations higher fares are (or were) charged than by the South Eastern and Chatham route. Presumably as "time is money," passengers prefer to pay a few pence extra fare to perform the journey in considerably less time.

In and Out Fares on the Same Route.

A WATFORD reader quotes fares on the Central Wales–Swansea section of the London and North Western Railway,* where the practice adopted on the Reading section of the South Eastern and Chatham Railway

* To prevent continual repetition of "Section of the Railway" we mention the lines under their ownership prior to grouping.

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is not followed. He gives the following table :—

	Miles.		Fare.	
Euston to—			s.	d.
Builth Road	220	(approx.) ..	24	10
Garth ..	225	,, ..	23	2
Llangammerth Wells	230	,, ..	23	5
Llanwrtyd Wells	232	,, ..	23	10
Llandovery	242	,, ..	25	3
Llandilo ..	253	,, ..	25	9
Gowerton ..	271	,, ..	25	9
Mumbles Road	275	,, ..	24	10
Swansea (Victoria)	278	,, ..	24	10

The fare to Builth Road is apparently based on the shorter route from London—a composite one, Cambrian* to Three Cocks Junction, Midland,* thence to Hereford and G.W.R. Hereford to London, a total distance of 186 miles, whilst the fare to Garth is apparently less than 1½d. per mile for 186 miles. The fares to the two "Wells" are, we believe, based upon an understanding that the Welsh spas should have approximate equal treatment in the matter of fares. The Llandovery fare is probably the sum of the local and Llanwrtyd Wells fares; it is 8d. less than the fare by the G.W.R. route of 228 miles. The G.W.R. Paddington–Llandilo fare is the same as its Llandovery fare, and this enables the London and North Western Railway* to make an addition and still be within Great Western Railway fare. The London and North Western Railway* Gowerton fare is 6d. more than the Great Western Railway, but this excess may be because of local fares. The Swansea fare is the same as the Great Western Railway, which obviously governs it.

Our Watford reader calls attention to the anomalies in the fares on the Cheshire Lines between Liverpool and Southport. By the same train the fares from Liverpool Central are :—To Garston (5½ miles) and all stations to West Derby (13 miles), 7½d., while to Aintree, 3¾ miles beyond the fare, is only 7d.; yet to Altcar (22¼ miles) the, fare is 1s. 2½d., an addition of 7d. for 5½ miles. The explanation is quite simple; the Cheshire Lines route to Southport is primarily for the Warrington and Manchester traffic to and from Southport, and a traveller from Liverpool Central goes some miles due east towards Manchester before he joins the Halewood–Southport line, which runs north-west. At Aintree the train from Liverpool Central has made a 16¾ miles' *détour* around Liverpool, and is only 5 miles from Liverpool (Exchange) by the Lancashire and Yorkshire Railway,* whose fare is 7d. The addition of 7d. for the 5½ miles from Aintree to Altcar is less than the statutory 1½d. a mile. It should be mentioned that in 1913 a railway in connection with the Cheshire Lines was authorised between Sefton and Seaforth, which will provide by means of the Liverpool Overhead Railway a direct line to Liverpool, avoiding the long *détour*.

* *See* note on p. 237.

Fares Quoted for Circuitous Routes.

THE same reader raises a curious point, *i.e.*, is a railway obliged to issue tickets between any pair of stations on its system? He mentions that at the Barnet stations of the G.N.R.* fares are shown: High Barnet to New Barnet, about a mile apart by road, of 1s. 8d., and High Barnet to Hadley Wood, less than 2 miles, 1s. 10d.; High Barnet to St. Albans, 3s. 3d. All these railway journeys necessitate travelling south to Finsbury Park, 9 miles, changing there and then travelling north on a line that is roughly parallel. In the case of St. Albans, the journey is continued northward of New Barnet to Hatfield (10 miles) before a turn is made westward, the total distance by train being 31 miles, against 10 miles by road with a frequent motor-'bus service.

Motor-'buses and trams have done much to provide direct transport between places a few miles apart by road, but to journey from one to another by railway necessitates a long *détour*. Edgware has now a tube railway connecting with the North West and West of London, and for several years tram and motor 'buses have connected it with the same districts of London. Many years ago we had experience of the want of direct communication in this district in connection with legal proceedings. Dudding Hill is (or was) in the Edgware Petty Sessions district, and though only 4 miles apart by road, it was necessary to travel by Midland train (if the line happened to be open) to St. Pancras, 7 miles, and thence by G.N.R. from King's Cross to Edgware, a further 11¼ miles, or a rail journey of over 18 miles, to reach a place 4 miles distant.

A Notable Run on the C.P.R.

MR. ERIC CRICKMAY, writing from New York, sends particulars of a notable run timed by him recently when travelling by the C.P.R. express known as "The Canadian," from Smiths Falls, Ontario, to Montreal. This train, he points out, has some of the fastest booked times on the C.P.R. The log is set forth in the table on the opposite page.

In his covering letter Mr. Crickmay draws attention particularly to the allowance of only 86 minutes for the 73½ miles from Bedell

* *See* note on p. 237.

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to a conditional stop at St. Clet, when no less than 14¾ minutes were gained. Mr. Crickmay continues: "I believe this log to be of general interest, as the C.P.R. is not generally thought of in connection with really fast trains. The run was timed by means of a Waltham watch from the rear platform of the observation car. There are few complicated junctions *en route*, and the line is double throughout, and seems to be fairly easily graded."

Recently, on the 5-hour crack run from Quebec to Montreal by C.P.R., no time was lost in spite of a terrific three-hour storm, during which a hut right by the train was struck by lightning and fired." Mr. Crickmay then gives particulars of one of the best runs he has recorded on the C.P.R. This was made in July, 1921, when C.P.R. train No. 14 left Lake Louise 24 minutes late, ran to Banff, 34·7 miles in 46 minutes (schedule 62 minutes), and then ran to

Booked Time.	Place.		Actual Time.	Distance.	Station to Station Average Speed.
2.50	Smiths Falls	dep.	3.11¼	—	—
	Bedell	arr.	3.33½	20·8	56·09
3.20	Bedell	dep.	3.36½	—	—
	Inkerman	pass	3.49	32·9	58·08
	Winchester	pass	3.52¼	36·1	59·07
	Chesterville	pass	3.57½	42·0	67·4
	Finch	pass	4.04	49·7	71·3
	Monklands	pass	4.15	60·6	59·4
	Apple Hill	pass	4.20½	66·0	58·9
	Glenroy	pass	4.26¼	72	57·5
	Glen Norman	pass	4.33¼	78·5	57·1
	St. Telesphore	pass	4.39¼	85	65·0
4.46	St. Clet	pass	4.47¾	94·3	65·6
	St. Lazare	pass	4.53¼	100·3	65·4
	Vaudreil	arr.	4.57¾	105	62·6
	Vaudreil	dept.	4.58¼	—	—
	St. Annes	arr.	5.04½	108·3	31·6
5.04	St. Annes	dep.	5.04½	—	—
	Beaconsfield	pass	5.12½	113·7	40·5
5.25	Montreal West	arr.	5.24½	124	51·5
5.40	Montreal, Windsor Street	arr.	5.37½	128·7	—

Overall average, 52·7. Average Smiths Falls to St. Annes, 57·3.
Average Glen Norman to Vaudreil, 64·6. Average Bedell to Vaudreil, 62·1.
Special stop at Vaudreil to let Divisional Superintendent off. On the adjoining tracks a C.N.R. train passed at about 60 miles per hour, drawn by one of the huge 6,000 4-8-2 class hauling 12 cars. The stop at St. Annes was only momentary.
Engine 4-6-2, No. 2229. Engineer Martin. Load, 9 cars, about 500 tons. Weather, fine, hot and clear.

Making up Lost Time.

MR. CRICKMAY then gives a few remarks based upon his rather wide experience of rail travel in the United States and Canada, indicating that time lost is "invariably made up or at least a gallant effort is made to do so." He continues: "Once on the 'Golden State Limited,' we left El Paso two hours late and arrived at Los Angeles on time. Running from Calgary, Alberta, to Edmonton, Alberta, the engine gained 39 minutes on the 7-hour run, and this with the temperature at 25 degrees below zero, making it hard to keep a full head of steam. Only the other day, on the New York Central between Poughkeepsie and Troy, we covered the 60 miles in exactly 72 minutes, gaining 14 minutes because the train was late. Calgary, 81·9 miles in 126 minutes gross or 119 minutes net, arriving 2½ minutes early and improving on schedule to the extent of 22 minutes. The engine was No. 583, 4-6-0 class, and the load was seven passenger cars, five bogie box cars with mail, plus one parlour car off at Banff. Weather was fine. The line is single throughout and abounds in curves and gradients.

Mr. Crickmay concludes his letter with the following remarks concerning Canadian and United States railways: "It might interest you to know that the C.P.R. track for the whole 338 miles from Montreal to Toronto has recently been laid with 100-lb. rails and rock ballasted. Looking around the Grand Central station on the Friday before Labour Day, I noticed the 7.10 p.m.

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to the Adirondack Mountains running in six sections, there being exactly 50 Pullman sleeping cars included therein!"

Isle of Wight Railway History.

THE railways of the Isle of Wight have always provided fascinating study for the railwayist, because the small systems there reproduce a microcosm of the competition, ideas, practices, engineering, rolling-stock, &c., found on the mainland, and as regards the two last items, retained in service types practically obsolete in Great Britain. The article, "Isle of Wight and the Southern Railway," in the April number of the RAILWAY MAGAZINE, has resulted in letters from the Island, showing that local partisanship has not been killed by the inclusion of all the local railways in the system of the Southern Railway. A Sandown reader, for example, stoutly maintains his opinion that the Isle of Wight Central Railway is the "premier" (which he translates as "pioneer") railway of the Island, and further takes exception to other remarks in the article, which he considers compares the Central Railway unfavourably with the Isle of Wight Railway. Many of the points raised are merely matters of opinion, and others result from ambiguous wording. Doubtless had Mr. Tripp thought his article would cause to blaze afresh the fires of railway partisanship in the Isle of Wight, he would have been more precise in his remarks.

Treating Isle of Wight railway matters in a broad manner, the pre-grouping situation may be summed up as follows: Ryde has always been the chief point at which travellers to and from the Island land or embark; its nearness to the mainland ensured this. A railway from Ryde to the other parts of the Island most favoured by visitors, *i.e.*, Sandown, Shanklin and Ventnor, ensured a remunerative traffic for the company owning such a line. This is the Isle of Wight Railway, opened in 1864; the line from Cowes to Newport was opened in 1863, and, like the Isle of Wight Railway, was a financial success. Promoters, as usual, sought to exploit the success of these two companies by promoting other lines, which were in some cases directly competitive with the Isle of Wight Railway. As a result, the Island railways were over-capitalised, and except the Isle of Wight Railway, and the Cowes and Newport Railway, were financially unsuccessful. The unsuccessful undertakings, with the Cowes and Newport Railway, were amalgamated in 1887, as the Isle of Wight Central Railway, and the two other lines in the Island were worked by the Central Railway, which remained financially unsuccessful. The Isle of Wight Railway, which thus remained outside the combination, therefore was considered the "premier" Island railway, because it was a financial success and served by one direct route the principal resorts, whilst the Central Railway had four practically distinct routes, dependent upon one another at Newport for connections. This arrangement tended to unpunctuality, and as a result the one service of the Isle of Wight Railway appeared to be better conducted than those of the Central Railway, and so strengthened the public estimation of its superiority.

Competition between the Island Railways.

THE Isle of Wight Railway, possessing, as we have shown, the direct routes between Ryde, the chief port of entry to and exit from the Island, and the three chief holiday resorts, had merely to provide a reasonable train service to earn all the money possible from the traffic. On the other hand, the Central Railway, since its subsidiaries completed their lines to Ventnor and Freshwater, had an entirely different problem, viz., to persuade people to reach the places served by it by the route that gave the longest journey over its system. The apparently obvious route between London and Freshwater is *via* Lymington, but the Central Railway pushed the route *via* Ryde, because every passenger travelling that way travelled the whole length of the Island by the Central Railway. So, too, the Cowes route to Sandown and Ventnor was pushed, whilst travellers were advised to reach Cowes *via* Ryde, from which place there also was a competition for the Ventnor traffic, and we suppose that if anyone were willing, he would have been conveyed *via* Newport by the horseshoe route from Ryde to Sandown. This necessity for pushing its services kept the Central Railway in the public eye, and gained for it a reputation for progressiveness.

When the lease of the Yarmouth and Newport Railway expired, the working company (the Central Railway) was under fresh control, but the old fighting spirit existed, and once again the Island was the scene of a railway war, necessitating the Freshwater Company providing its own rolling-stock and also a platform at Newport. Passengers had to make a *détour* on foot between the premises of the two lines at Newport.

Locomotives and Rolling-Stock.

THE rolling-stock of the Island railways has always been of an extremely heterogeneous character, largely resulting from the locomotives and coaches being purchased second-hand. Such new stock as was pro-

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vided naturally had a long life under the conditions of working obtaining on the Island lines, and therefore the types had become obsolete elsewhere long before the Island lines scrapped their specimens. The Isle of Wight Railway (save for its Brading branch engine taken over with the branch from the local company, which engine went overseas during the war and never returned) started with 2-4-0 tanks and retained them ever since. The Isle of Wight Central Railway had a very mixed locomotive stock. It started with three second-hand 2-2-2 tanks, then a 0-6-0 saddle tank was obtained, replaced during recent years by a 0-4-2 of the same type; there were four 2-4-0 tanks, one from the M. and S.W. Junction Railway. Of 4-4-0 tanks at various times owned by the Company, one was a N.L. engine and another a N.E. engine. The latter went overseas during the war and never came back. Finally, there were four 0-6-0 London Brighton and South Coast "Terriers." When the Central Railway dismantled the rail motor provided for working the F.Y. & N. line, the engine of the combination was in service for some time as a separate entity; so, too, was the car. The F.Y. & N. Railway had a Brighton "Terrier," which it purchased from the late L. & S.W. Railway.

There are two features in connection with the Island railways that are likely to be forgotten:—The Stokes Bay route to Ryde, with a water passage of only 2¾ miles, and the rail ferry service from Langston Harbour to Brading. The former, opened about 65 years ago, gave the late L. & S.W. Railway access to Ryde independent of joint ownership of the Portsmouth line. After the Isle of Wight steamers were taken over jointly by the L. & S.W. and L.B. & S.C Railways, the Stokes Bay route was not pushed to the same extent. It was known as "the family route," and in more recent years was only used during the summer season, and several years ago was abandoned altogether.

The goods train ferry between Langston and Brading was supported by the L.B. & S.C. Railway, which acquired the undertaking in 1886, but did not continue it for long. The steamer *Carrier* engaged in this service previously worked on the N.B. Railway train ferry service between Granton and Burntisland.

Cheaper Rail Excursions.

It was recently announced that several leading railway companies had agreed to reduced fares for both guaranteed and advertised day and half-day excursions, and now we are informed that the arrangement has been adopted generally. In the main, it means that a large proportion of excursion traffic will benefit by reductions ranging up to 33 per cent. upon the rates previously operating, providing the distance exceeds 80 miles. It will be to the advantage, especially of factory, works and other parties, who, by guaranteeing a minimum load, will be given the benefit of monetary reductions which, both individually and on a collective basis, will represent substantial monetary gains. Similar arrangements applying to excursions arranged by the companies will, however, give similar advantages to the individual traveller. The reductions for journeys of any considerable length will be relatively substantial. There is the further point that new fares are given in level values, thus avoiding the odd pence so frequently involved hitherto. The new scales are, in fact, progressive according to distance, thus opening the way for the advertisement of attractive level-money fares, more or less independent of exact distance calculations.

Raids on Coal Trains.

Attention has recently been directed by the *Western Mail* to the serious extension of the practice of pilfering from coal wagons in South Wales. Our contemporary goes so far as to describe occurrences that have lately taken place in the Dowlais area as organised raids on coal trains. One colliery company reports the theft of nearly 300 tons a month from wagons standing on their sidings, and these thefts have been committed in spite of the vigilance of the company's own police. Perhaps the most familiar form of theft is that committed from standing trains waiting for signals. The raiding parties, which appear to be well organised, have not gone so far yet as actually to hold up a train and loot it, but there are places on the G.W.R. and L.M.S. lines where the engine driver dare not slow down. If he has to slow down for signals, the raiders swarm over the coal wagons, and very soon tons of coal are thrown over the side to be carried away at leisure. In this way wagons have been known to arrive at their destination from two to three tons short of the weight of coal with which they were originally despatched. These organised bands of raiders, who are protected by a screen of scouts, on receiving the signal that a train is coming, hide amongst the little valleys and depressions caused by colliery operations. Alarm is given by the scouts of any suspicious stranger, and when the forces of law and order arrive on the scene no one is visible. Our contemporary severely blames the magistracy for their leniency in dealing with the few coal raiders that have so far been caught.

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Manchester and Milford Railway Locomotives.

ARISING from references in the January number, Mr. A. L. Cooke sends some further remarks: The two 2-4-2 tanks *Cader Idris* and *Plynlymmon* were numbered 1306 and 1307 by the G.W.R. Another engine taken over by the G.W.R. was a mineral engine which the M. & M.R. had acquired from the L.N.W.R. This engine (L.N.W. No. 1095) was one of Mr. Webb's standard 0-6-0 tender engines, built in 1882, with 17-in. by 24-in. cylinders, 160-lb. pressure, and 4-ft. 3-in. wheels. The M. & M.R. numbered it 7. When the G.W.R. took the engine, they renumbered it 1338, and made several minor alterations to it; it was fitted with a G.W.R. type smokebox door, and a steel-framed tender was substituted for the original one. The engine is now scrapped, and the number 1338 is borne by a 0-4-0 tank ex Cardiff Railway.

Grouping Developments on Irish Railways.

MR. H. W. LEA writes as follows:—"Since the last week in January there have been some interesting developments as regards transfer of locomotives to the D.S.E. section, consequent on the amalgamation of all the railways (except the Great Northern) in the Free State area. The first arrivals were G.S. and W. 0-4-4 tanks Nos. 48 and 80, closely followed by M.G.W. 0-6-0 tanks *Bat*, *Lark* and *Achill*, formerly used chiefly on the Broadstone–North Wall service and branch lines. These have all been taking their turns in working Dalkey and even Bray trains, a considerable number of the D.S.E. locomotives having been sent to Inchicore for repairs. A number of old G.S. and W. 0-6-0 tender goods engines, Nos. 128, 103, 165, &c., have also been much in evidence at the Grand Canal Street sheds. No. 128 has been working passenger trains between Westland Row and Bray, as has also a M.G.W. 2-4-0 tender locomotive, *Aurora*, No. 34, one of the superheated engines of this class recently fitted at Broadstone with a new pattern cab, which considerably improves their appearance. Another interesting transfer is a G.S. and W. 4-4-2 tank, No. 274 (an ex Waterford and Limerick locomotive, I understand), while I am told that G.S. and W. 4-4-0 express locomotive No. 87 is stationed at Bray and is working on the Wexford mail service."

Southern Railway Developments at Leatherhead.

AT present there are two stations, the South Western and the London Brighton, and the service is entirely carried out by steam trains. Trains from the South Western station go to Waterloo, and those from the Brighton station to Victoria and London Bridge. This part of the line will be ready for the electric service in July next, and in order to simplify the working, both from the railway and public's point of view, it has been decided to concentrate on the "Brighton" station, from which place all passenger traffic will be handled, the South Western station being closed down. The rebuilding and alterations necessary to bring this about will take, roughly, 12 months, and will cost some £24,000. For that reason the two stations will continue to be used this summer and next winter as before. When the alterations are complete, however, all trains will leave from the Brighton station. The electric trains will run from Waterloo, but the service of steam trains to and from Victoria and London Bridge will be maintained. Thus it will be seen a vastly improved service will be given to Leatherhead. In addition to the steam trains already mentioned, there will be three electric trains an hour, which will make the journey to London in from 10 to 15 minutes shorter time. New and modern rolling-stock will be used, and the acceleration of the service will enable many more passengers to be carried in greater comfort. Additional siding accommodation will be built in connection with the goods yards, to enable goods trains to be placed clear of the running lines, and to facilitate shunting. All goods and coal traffic will, as far as possible, be dealt with in the South Western goods yard, thus making a clear division between the passenger traffic and the goods, which will make for quicker handling of both. The existing signal-box at the Brighton station will be replaced by a modern one. While the structural alterations outlined will not be complete by July, the full service of electric trains will be put into operation from the two stations, in order that there shall be no delay in giving the increased service.

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WHAT THE RAILWAYS ARE DOING.

Mr. W. J. Smith, who has been appointed Superintendent of Works in the Carriage and Wagon Department at Derby, including Plaistow, Stoke, and Crewe, L.M.S.R., entered the service of the late Midland Railway Company in 1884. After having experience in all branches of the Carriage and Wagon Department, he entered the works drawing office in 1891, rising to Chief Works Draughtsman about 12 years later. He held the later post until July, 1915, when he was promoted to Works Assistant, becoming Assistant Works Manager in the following year, and Works Manager in March, 1923. He was awarded the M.B.E. in connection with railway work for war service.

Photo.] [*W. W. Winter*

MR. W. J. SMITH,

Appointed Superintendent of Works, Carriage and Wagon Department, Derby, &c., L.M.S.R.

* * *

Mr. J. H. B. Jenkins, who has been appointed Chief Chemist, L.N.E.R., started his railway career with the Great Western Railway in the Mechanical Engineering Department under the late Mr. William Dean. At the end of his apprenticeship he gained a Whitworth Exhibition, and having been studying chemistry and physics under the company's chemist, Mr. F. W. Harris, he passed into the chemical laboratory, which had then recently been established. Shortly after the establishment of a small chemical laboratory at Stratford by Mr. James Holden, Locomotive, Carriage and Wagon Superintendent, about 32 years ago, Mr. Jenkins came to Stratford as the Great Eastern Company's Chemist, and he has since been responsible for the conduct of the ever-growing work of the laboratory, which has comprised investigation, analyses, &c., not only for the Mechanical Engineering Department, but also for the Civil Engineer, the Goods Manager, the Claim Sections, the Stores Superintendent, &c. Mr. Jenkins is a past Vice-President of the Society of Public Analysts, a Fellow of the Institute of Chemistry, and a Fellow of the Chemical Society. He has also served on Committees of the British Engineering Standards Association, and on the Government Committee now investigating the qualities desirable in cylinders for compressed gases.

* * *

We are officially informed that the Directors of the London and North Eastern Railway Company have appointed Mr. G. F. Thurston, Joint Secretary of that company, to be Chief Stores Superintendent, in succession to Mr. W. T. Weeks, who retired from the service on December 31 last. We are also advised that Major R. C. Carr, Hotels Superintendent of the Great Northern Section of the London and North Eastern Railway, will retire from the service on March 31 next. On the same date, Mr. L. Sydney Smith, Hotels Superintendent of the Great Eastern Section, will relinquish the temporary duties which he has discharged for two years as Hotels Superintendent of the Great Central Section. Owing to the increase in business on the Great Eastern Section, Mr. Smith will devote the whole of his time in future to his duties as Hotels

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Superintendent of that section. Mr. J. E. Ryan, at present Hotels Superintendent for Scotland, has been appointed Hotels Superintendent of the Great Central and Great Northern Sections.

* * *

In consequence of a severe and prolonged illness, Mr. John E. Charnley has found it necessary to resign his position as Manager and Secretary of the Cheshire Lines Railway as from the end of January. Mr. Charnley entered the Lancashire and Yorkshire Railway service in 1877 as a junior clerk in the Goods Department, and served successively in the delivery, shipping, accounts and general sections before obtaining promotion as an Assistant Goods Agent at a large depôt. In 1883 he was transferred to the Lancashire and Yorkshire headquarters staff at Manchester, dealing with the operation of freight services. Two years later he was appointed on the staff of the General Superintendent and became Confidential Secretary to that officer in 1889. In 1889 he was appointed Superintendent of the Eastern section of the Lancashire and Yorkshire Railway. The services rendered in that capacity led to his appointment in 1911 to the Management of the Cheshire Lines Railway. Mr. Charnley has twice attended the International Railway Congress as a delegate and has delivered special courses of lectures on Railway Economics at the Manchester University.

* * *

The Directors of the London Midland & Scottish Railway have appointed Mr. Arthur Edward Towle to be Controller of the Company's Hotels, Refreshment Rooms and Restaurant Car Services, as from February 1, 1925.

* * *

Mr. Arthur Edward Towle, who has been appointed Controller of Hotels, Refreshment Rooms and Restaurant Car Services, L.M.S.R., is the son of Sir William Towle, who preceded him as Manager of the Midland Railway Hotels from 1871 to 1914, and brother of Lieut.-Colonel Sir Francis W. Towle, Managing Director of Gordon Hotels Ltd. Mr. Towle was educated at Marlborough College, and after leaving school spent several years travelling, gaining experience in hotels in America and on the Continent. He entered Midland Railway service in 1896, and on August 5, 1898, he and his brother, Mr. (now Sir) Francis Towle, became Joint Assistant Managers under their father, Mr. (now Sir) William Towle. On April 21,

Photo.] [*Elliott & Fry.*

MR. G. F. THURSTON,

Appointed Chief Stores Superintendent, L.N.E.R.

Photo.] [*F. Foxall Ltd.*

MR. A. E. TOWLE, C.B.E.,

Appointed Controller of Hotels, Refreshment Rooms and Restaurant Car Services, L.M.S.R.

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1911, they were associated directly with their father as Joint Managers of Hotels and Refreshment Rooms, and on his retirement in March, 1914, they took over full control jointly. On Sir Francis Towle's retirement towards the end of 1919, Mr. A. E. Towle became sole Manager of Hotels and Refreshment Rooms. He received a C.B.E. in January, 1919, for war services. In the interim organisation, which became effective as from January 1, 1923, Mr. Towle became Manager of Hotels and Refreshment Rooms, Midland Division, with headquarters at St. Pancras.

* * *

Mr. George Francis Thurston, who has been appointed Chief Stores Superintendent, London & North Eastern Railway, in succession to Mr. W. T. Weeks, has held the position since December, 1922, of Joint Secretary with Mr. J. McLaren, of the London & North Eastern Railway Company. Mr. Thurston became Secretary of the late Great Eastern Railway Company in July, 1919, on the appointment of Mr. S. A. Parnwell to be Assistant General Manager. Mr. Thurston entered Great Eastern Railway service in the Goods Department at Bishopsgate in 1885. He was transferred to the District Goods Manager's Office in 1889, and to the Funds Office in 1890. On the inauguration of the Railway Conciliation Scheme in 1907 he became Secretary of the company's side of the respective boards. He was appointed Secretary of the Superannuation, Pensions and Accident Funds in 1910, and Staff Assistant to the General Manager in 1917.

* * *

The death occurred last month of Mr. Frank Audinwood, Hotels Manager for the Northern Counties Committee (L.M.S.R.), Ireland. He entered Midland Hotels service at Derby as a boy and, prior to his Irish appointment, spent some 21 years in that company's service, though not continuously. He was for four years with the Great Northern Railway Company as Manager of their Bradford and Leeds hotels, but returned to Midland service as Hotels Inspector about 1903. In March, 1908, he received the appointment of Manager of the hotels, refreshment rooms, and cars on the M.R., Northern Counties Section (Ireland), a position he held with distinction until last year, when he retired through ill-health.

* * *

Following the quarterly meeting of the General Managers' Conference held at the Irish Railway Clearing House, Dublin, on January 8, the members assembled to take a farewell of their oldest colleague, Mr. E. A. Neale, General Manager of the late Great Southern and Western Railway. The Chairman of the Conference, Mr. C. A. Moore, General Manager, Belfast & County Down Railway, presided. Mr. Bagwell (G.N.R.), Mr. Barry (B. & I.S.P. Company) and Mr. Ede (L.M.S.R.) further spoke in appreciation; also Messrs. Baird (Burns & Laird Lines), Patterson (D. & N.S.P. Company), Mauger (G.W. Railway), Phillips (Grand Canal Company), F. E. Jones, and W. E. Richardson. Mr. M. F. Keogh, in asking Mr. Neale's acceptance of a grandfather clock, the gift of his colleagues, associated himself with all that had been said in that gentleman's praise. Mr. Neale suitably replied. Letters and telegrams regretting inability to attend were received from Messrs. Berkeley, Coulter, Hunt, Pepper, Prossor, O'Connor, and Sinnott.

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At a meeting of the Irish Railway Clearing House Committee, held on January 28, the Right Hon. Sir William J. Goulding, Bart., was unanimously re-elected Chairman of the Committee for the year 1925.

* * *

Mr. James Boot, hitherto Chief Assistant for Signals and Telegraphs to Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent, Southern Railway, has rejoined the signalling staff of Siemens Bros. and Co. Ltd.

* * *

The annual winter dinner of the Permanent Way Institution was held on Saturday, January 31, at Moorgate Street Station Restaurant under the Chairmanship of Mr. E. A. Wilson, O.B.E., M.C., M.Inst. C.E., Chief Engineer, Metropolitan Railway, who had been re-elected President for the third year at the annual business meeting held earlier the same day. There was a good attendance, the President being supported by Sir Bradford Leslie, K.C.I.E., M.Inst.C.E., and by Messrs. John Miller, B.Eng., M.Inst.C.E., Chief Engineer, North Eastern Area, L.N.E.R., W. Cleaver, M.Inst. C.E., W. Willox, and J. R. Robertson, Past-Presidents, and others.

* * *

Mr. C. E. Drewett, who since the opening of the Lynton and Barnstaple Railway in 1898 had been Secretary and Manager of that line, has retired from railway service extending over 40 years. When the Lynton and Barnstaple Railway was acquired by the L. and S.W. Railway, the Directors of the first-named company presented Mr. Drewett with a silver salver as a personal gift in appreciation of his services.

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MR. J. HARDMAN, Station Superintendent at Perth general station (L.M.S. and L.N.E. Joint), retired at the end of January. Mr. Hardman has had charge at Perth for the past 22 years. He is succeeded by Mr. J. Rankin, Assistant Station Superintendent, Glasgow (Central).

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MR. JOSEPH C. SYKES, A.M.Inst.C.E., M.I.Mech.E., M.Inst.E.E., Hon. General Secretary of the Institution of Locomotive Engineers, and late Managing Director of the W. R. Sykes Interlocking Signal Co. Ltd., is retiring from all active participation in the management of that company, with a view to devoting his energies to other work.

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MR. S. E. FAY has been appointed Traffic Manager of the New Zealand Government Railways.

* * *

MR. G. S. LYNDE has been appointed Chief Mechanical Engineer of the New Zealand Government Railways in succession to Mr. E. E. Gillon.

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THE Directors of the London and North Eastern Railway have appointed Mr. G. B. Barton to the position of District Engineer, Boston, as from January 1, 1925, in succession to Mr. A. Burridge, who has retired owing to ill-health.

* * *

WORK has now been commenced on the entire reconstruction of Piccadilly Circus station, London Electric Railway. The existing station was opened in 1906, but the traffic dealt with since then has increased from 1½ to 18 million passengers per annum. The new station will have an annual capacity of 50 million passengers, and will be constructed about 15 ft. below the ground level of Piccadilly Circus. Five escalators will connect the booking hall with a landing, from which four more escalators will run, two feeding the Piccadilly line and two the Bakerloo.

* * *

THE driver concerned in the Haymarket, Edinburgh, fatal collision of July 28 last, was unanimously acquitted by the jury in the Sheriff's Court, Edinburgh, on January 29.

* * *

THE London Midland & Scottish Railway have placed orders for 235 third-class vestibule coaches, 35 of which will be fitted with brake compartments. Contracts for these have been placed with the following firms :—

Cammell Laird & Co. Ltd. (Nottingham).
The Birmingham Railway Carriage and Wagon Co. Ltd.
The Leeds Forge Co. Ltd.
The Metropolitan Carriage, Wagon and Finance Co. Ltd. (Birmingham).

These vestibule coaches are to be of new type, and an interesting feature of the specification is the entire use of steel for their bodies and frames, which are to be built in one unit. Where it may be necessary to introduce timber for fittings and linings, special wood of a practically non-inflammable kind will be used.

* * *

IN addition to locomotive contracts already placed by the London Midland & Scottish Railway, an order has just been secured by Nasmyth, Wilson & Co. Ltd. (Manchester) for five 4-4-2 passenger tank engines of the existing Midland type. These are for service on the London, Tilbury and Southend section of the system. Also for 10 Caledonian type 0-4-4 tank engines for Cathcart Circle Service in Glasgow. Other contracts have been placed for covered goods wagons, cattle wagons, 20-ton goods brake vans, &c.

* * *

AT the invitation of the L.N.E.R. members of the Selborne Society paid a visit of inspection to King's Cross terminus on Wednesday, January 14. Under the guidance of Mr. Hind, of the Publicity Department, the party, which included several ladies, climbed the clock tower, and descended to the dining-car stores and kitchens, and wine stores. A visit was paid to the milk platforms and the new locomotive coaling stage. The party watched a "Pacific" locomotive turned on the 70-ft. turntable, and saw it haul away the 4 p.m. Newcastle express. At the conclusion of the visit, which lasted over two hours, the party was entertained to tea by the L.N.E.R. at the Great Northern Hotel.

* * *

AT the meeting of the Great Eastern Lecture and Debating Society, L.N.E.R., held on January 7 in the Board Room, Liverpool Street station, Mr. D. E. Rose (Control Office, Liverpool Street) read a paper entitled "Co-operative Working on Railways," after which a keen discussion took place. The meeting was in able hands, as the Chairman for the evening was Lieut.-Col. H. H. Mauldin (Assistant Superintendent, Liverpool Street), who kindly deputised for Mr. John Miller (late Civil Engineer,

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Liverpool Street), that gentleman having been transferred to York.

* * *

DURING the 12 months ended December 31 last, no fewer than 1,811,164 meals were served in L.M.S. dining cars, this being an increase of 219,384 on the 1923 total, notwithstanding that the period covered included the locomotivemen's strike in January, 1924.

* * *

ACCORDING to the *Canadian Railway and Marine World*, in order to make important connections, a C.P.R. special train was operated recently from Broadview, Sask., to Winnipeg, 264 miles, in 4 hours 16 mins., an average of 61·9 m.p.h. The run from Broadview, Sask., to Brandon, Man., 130·9 miles, was made in 2 hours 20 mins., or 56·1 m.p.h., and from Brandon to Winnipeg, 133·1 miles, in 1 hour 55 mins., an average of 69·4 m.p.h.

* * *

APPLICATION has been made by the Metropolitan District Railway Company to the Minister of Transport for an Order under the Railways Act, 1921, to authorise the company by agreement to purchase and to hold land in the parish of Brentford, and to construct thereon an extension of the company's overhauling and repairing depot, workshops, car sheds, and other works constructed under the powers of the Ministry of Transport (Metropolitan District Railway) Order, 1921. Sanction is also asked to apply to the purposes of the Order any moneys which the company have power to raise.

* * *

A RECORD is claimed for a run made on the G.W.R. on January 13 with the 11.15 a.m. 2-hour express from Paddington to Bristol, the engine being one of the new "Castle" class locomotives, *Carnarvon Castle*. It is claimed that the run of 106·7 miles to Bath was made in 98 minutes. As, however, this is a slip service, the run, although made in 8 minutes within the very fast schedule time of 106 minutes, is not quite the same thing as an actual start-to-stop run made with the complete train.

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A READER reports that a second complete articulated train for Scotch services is now running, the train concerned being the 1.15 from King's Cross, and the corresponding return train at 10 p.m. Great Northern local trains are appearing with their "set" numbers shown on the buffer ends of the coaches.

IN view of the growing public interest in the art of modern posters, the London Midland and Scottish Railway have decided to lend to municipalities, on application, the originals of their famous series by Royal Academicians. Some of these originals, with specimens of colour-printing illustrating the several stages in reproduction, have been already shown at Plymouth; and the Art Galleries of Cheltenham and Oldham are to have them for exhibitions beginning on February 16 and April 15, respectively. Sir Martin Conway, M.P., has written an "appreciation" of these works of art. This will be published shortly in the form of a brochure, and illustrated with coloured reproductions of the posters.

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THE Underground Electric Railways Company of London Limited and Associated Companies have contributed £1,050 towards the St. Paul's Cathedral Preservation Fund.

* * *

MR. J. F. GAIRNS, Editor of the *Railway Magazine*, is to give a lantern lecture, entitled "The Romance of the Railway Centenary," in the Lecture Hall at Fillebrook Baptist Church, Leytonstone, on Monday, March 16, at 7.45 p.m.

* * *

THE Pullman Car Co. Ltd. have placed an order for six cars for service on the Hastings route with the Metropolitan Carriage, Wagon & Finance Co. Ltd.

* * *

ON Tuesday, February 3, the Canadian National Railways station (C.N.R.A.) at Moncton, Canada, broadcasted a programme designed particularly for an English audience. The programme included addresses by Mr. W. D. Robb, Vice-President of the Canadian National Railways, and Sir Henry Thornton, Chairman and President.

* * *

THE L.N.E.R. announce that it has been decided that in future all new trains, including main line sleeping cars, restaurant cars, and suburban trains, are to be constructed on the "articulated" principle. It will be remembered that the Great Northern was the first British railway to adopt this new method of construction, introduced by Mr. H. N. Gresley, which means a tremendous advance in comfortable travel. In addition to realising increased comfort, the principle enables more carriages to line up at a platform than heretofore, the space formerly occupied by buffers being considerably reduced.

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ACCORDING to the *Scotsman*, Mr. H. G. Burgess, General Manager, L.M.S.R., has informed the Inverness Town Council that, having been impressed by the fact that Inverness is the centre of a considerable section of railway, it has been decided that, under present conditions Inverness was the most convenient centre at which to continue certain repair work to engines, carriages and wagons, and they did not, therefore, for the present, propose to make any material change in their arrangements.

* * *

THE annual congress and dinner of the Institute of Transport will this year be held in London. It will open on Wednesday, May 13, and conclude on the Saturday following. On the mornings of the three first days, meetings will be held at the Institution of Electrical Engineers for the reading and discussion of papers. The afternoons of those days will be devoted to visits to places of transport interest. For the concluding day a special visit is in contemplation. The Institute dinner will take place at the Hotel Cecil on Wednesday, May 13.

* * *

THE "Underground" (Exchange) station, situated in the forecourt of the Southern Railway station at London Bridge, has been reopened for traffic. The old lifts, which have done 24 years' service, have been taken out and new high-speed lifts installed in their place.

* * *

SIR LESLIE WILSON, the Governor of Bombay, on February 3, opened the first electric railway in India, the Harbour Branch of the Great Indian Peninsula Railway.

* * *

MR. C. WILLIAMS sends notes from Crewe as follows:—No. 4108, the second of the Midland type goods engines now building at Crewe, is in traffic. It is finished similar to No. 4107, *i.e.*, in shop grey, but with the addition of the number in large yellow figures on the tender sides. Apart from the usual number-plate on the smokebox door, No. 4107 is at present unnumbered. Two further 0-6-0 shunting tank engines have been delivered by the Hunslet Engine Company, Nos. 7141 and 7142, whilst the latest 4-6-0 four-cylinder passenger engine to be delivered for service direct from the Horwich Works is No. 10460. Nineteen additional compounds of the Midland 4-4-0 type are also being delivered to this section, Nos. 1076 to 1084 inclusive. The Exhibition engine, No. 5845 (4-6-0) is now in regular working, but without the name-plates, *Prince of Wales*, which have been removed in accordance with the original plan. On the other hand, it is interesting to note that the name-plates of the original engine, viz., No. 819, *Prince of Wales* (now L.M.S. 5600), which were also a short time ago removed, are to be replaced forthwith. No. 1923, *Agamemnon*, a 4-4-0 compound and the last of the "Jubilee" class engines, has been converted to "Renown" class (two-cylinder simple). Nos. 374, *Empress*, and 811, *Express*, both of the 4-4-0 "George the Fifth" class (formerly "Precursor" class), have been fitted with Belpaire boilers, the latter being stationed at Rugby. Recent withdrawals include No. 773, *Centaur*, a 6-ft. 2-4-0 straight-link class engine.

* * *

MESSRS. LEWENZ & WILKINSON LIMITED, of 25, Victoria Street, Westminster, S.W. 1, are agents for the United Kingdom for the Schlomann-Oldenbourg Illustrated Technical Dictionaries, which are published in English, French, German, Italian, Spanish and Russian. Mr. H. B. Lewenz, M.I.E.E., M.I.Mech.E., is Editor and Manager for the British Section. Volumes have already been published up to XV, and will be followed by others on mining, agricultural machinery, chemistry, gas engineering, &c.

* * *

MR. J. G. B. SAMS has been appointed Locomotive Assistant, Jamaica Government Railways.

* * *

ON the invitation of Mr. J. E. Dalrymple, Vice-President, Canadian National Railways, Montreal, Mr. William Phillips, European Manager, is shortly returning to Canada to take up the position of Industrial Department Manager. Mr. C. J. Smith, Executive Assistant to Sir Henry Thornton, Chairman and President of the Canadian National Railways, will become Vice-President in charge of European affairs.

* * *

THE Cheshire Lines Committee have appointed Mr. W. H. Oates Manager and Secretary, in succession to Mr. John E. Charnley, who retired at the end of January in consequence of ill-health. Mr. Oates has been engaged in the service of the Cheshire Lines Committee during the whole of his business career. On leaving the Liverpool Institute in 1881 he was appointed a junior clerk at the Brunswick Goods Station. Transferred to the head office at Central station, Liverpool, in 1891, he was appointed Indoor Assistant to the Manager in 1909, and Assistant Manager in 1911.

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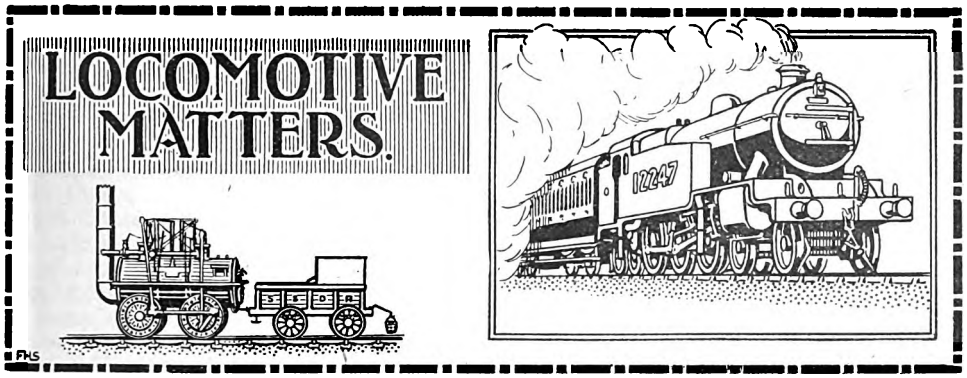

Under this heading will be inserted short references to news items relating to locomotive engines and their duties. It must be understood, however, that information as to the stations of particular engines cannot be given, for the reason that, before the date of publication, transfers may have taken place, while lists of engines, &c., debarred from "The Why and the Wherefore" section, cannot be included under this heading. With this understanding, notes as to matters thought to be of general interest will be welcomed.

L.M.S.R.

The engine *Prince of Wales* is out in the new colours, though up to the present it has not been given back its nameplate. It is at Edge Hill (26) shed. L. and Y. 0-8-0 No. 1500 is stationed at Warrington (23) shed; L. and Y. 2-4-0T No. 11534 is at Birkenhead (18) shed, and L. and Y. 2-4-2T No. 1019 at Stockport (16ᵉ) shed. There is a regular North Stafford goods working into Speke Junction sidings, consisting chiefly of Chatterly-Whitfield coal wagons. This is worked by N.S. 0-6-0's, including Nos. 90, 2351, 2361 and 2363. There has also been noted the M.R. section 0-6-0 No. 4107 mentioned by Mr. C. Williams. The latter is stationed at Crewe (15ᵉ) shed. The following Midland "singles" have been seen working on the C.L.C.: Nos. 614, 615, 617, 618, 627, 632, 647. Also one of the new 0-6-0T's, No. 7163, built by the Hunslet Engine Company, is stationed at Longsight (16) shed. L. and Y. 0-6-0 tanks Nos. 418 and 566 are stationed at the Tanhouse Lane shed on the C.L.C. for marshalling the goods trains coming from the United Alkali Company's works at Widnes.—["DAGMAR."]

Midland 0-6-0 No. 3943 was recently noted at Buchanan Street, Glasgow. Further 0-4-4 tank engines are being rebuilt at St. Rollox Works, one example being No. 15179.—[A. J. C.]

A North Staffordshire 0-6-2T is working in the Bradford (Midland) district, while L. & Y. expresses between Leeds and Manchester are sometimes hauled by a London and North Western 4-6-0 "Prince of Wales."—[J. MOORE.]

Several "Hughes" four-cylinder 4-6-0 locomotives hitherto working on the L.N.W. section have re-appeared on Lancashire and Yorkshire services. Among these are Nos. 1671, 10430, 10452 and 1656. There are now nine L.Y.R. 0-6-0 side-tank locomotives at Liverpool. These are Nos. 1352, 1355, 494, 496, 11537-8-9, 11544 and 11546, the last five arriving at the end of last year in quick succession. Nos. 11534, 1356 and 499 of the same class are stationed at Bellevue shed on the Midland system. Of the new Midland 0-6-0 tanks, Nos. 7121 and 7124 are at Edgehill (L.N.W.), 7135 at Birkenhead and 7136 at Longsight.—[N. PARRY.]

"P ince of Wales" class 4-6-0 locomotive No. 2340, *Tara*, was recently noted at Crewe fitted with direct motion and having an indicator shelter for trial purposes.—[R. O. HOLT.]

At the beginning of October, L.M.S. 7128, a new 0-6-0T, came to Dalry Road. C.R. No. 106, a "Balerno" 0-4-4T, is now L.M.S. 15149; 516 (0-6-0T) is now 16253; 924 (4-4-0) is 14439; 722 (4-4-0) is 14312; Nos. 956-959 (three-cylinder 4-6-0's) are all red now, as Nos. 14800-14803, and C.R. Nos. 474 (0-6-0T) and 548 (18-in. 0-6-0) are L.M.S. 16329 and 17247 respectively.—[W. E. BOYD.]

L.M.S. shunting tanks Nos. 7120 and 7136 are stationed at Longsight (L.N.W.). No. 87, an ex N.S. 4-4-0, is now numbered 596 (L.M.S.). *Centurion*, 1911, a "Jubilee" class locomotive, is now converted and stationed at Crewe. The engine which recently collided with a motor car was No. 1220 of the "Claughton" class. This accident occurred at Minshull Vernon.—[MANCHESTER READER.]

Besides some of the Midland "singles" mentioned in the February number, there were seen last summer Nos. 641 (of Nottingham);

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643, 649, 651, 652 and 654 (of Leicester); 645 (of Derby); 663, 668 (of Kentish Town), and 662. More recently, only one has been noted, owing to the winter decline in double-heading. 0-6-4T No. 2029 has for some time been running with Belpaire firebox, and its smokebox projects a little in front of its tanks. There are also, of course, several "2" class 4-4-0's with Belpaire firebox and extended smokebox, though not superheated.—["RADLETTIAN."]

A "George V" class, No. 811, *Express*, has been fitted with a Belpaire firebox, standard safety valves and altered cab, and is stationed at Rugby. No. 300, *Emerald*, is fitted in the same manner. No. 765, 4-4-0 Midland engine, is stationed at Rugby, L.N.W. shed, working locals from Rugby to Birmingham.—[J. TWELLS.]

L.N.E.R.

A large number of the Darlington-built three-cylinder 2-6-0's are on the G.N. section, besides Nos. 69 and 73. Nos. 75, 80, 92, 109, 112, 113, 114 and 118 are all at New England, and No. 91 was at King's Cross. The four "Pacifics" that were at Gorton, *i.e.*, Nos. 2547, 2548, 2550 and 2551, are now all at Grantham. With regard to Grantham's original "Pacifics," Nos. 1476, 1479 and 1480 have been to Doncaster for overhaul. Nos. 2543-4-9 are at Doncaster, and Nos. 2545-6 and 2552 have joined Nos. 4474 and 4475 at King's Cross sheds. Several ex R.O.D. 2-8-0's are working over the G.N. section, No. 6289 (Peterborough) and Nos. 6377 and 6253 have been south recently. Doncaster-built 2-8-0's Nos. 3496-3500 have joined Nos. 487N-495N at Peterborough, coming from Doncaster and Mexborough. G.E. 2-4-2T's Nos. 7176 and 7650 recently worked football excursions from Woolwich to Finsbury Park.—[J. R. WHITTLE.]

New 4-4-0 locomotives of the "Director" class have been noted in Glasgow to Nos. 6394.—[A. J. C.]

Nearly all the 0-6-0 shunting tanks, class "D," of North British design, which formerly had safety valves on the dome, are now rebuilt with "Pops" over the firebox. The latest are: Nos. 9808 (8/24); 9825, 9826, 9828 (10/24); 9807 (11/24); 9813, 9816, 9827 (12/24); and 9823 (1/25); while 9815 is either in the shops or newly out. Nos. 9799-9802 have also been rebuilt recently. G.N. renumbered 4-4-0 No. 3059 arrived from the South light on January 24 and went through to Glasgow. G.N. 2-6-0's and G.C. 0-6-0's and 2-8-0's are working on the N.B. section but do not come to Edinburgh. No. 2024 (N.E. class "R," 4-4-0) was rebuilt in December as a superheated engine, with "Pops" and frames like Sir Vincent Raven's locomotives. No. 66, *Aerolite* (2-2-4T), paid a short visit in November, 1924.—[W. E. BOYD.]

The following G.C. duplicate engines are repainted: Nos. 6415, 6441, 6484, 6434, 6427, 6440, 6442 and 6478.—[N. PARRY.]

King's Cross–Leeds expresses are now frequently hauled by G.C. 4-6-0's in the West Riding area, and G.E. 4-6-0 No. 1561E is also working between Doncaster and Leeds. Two G.C. 4-6-2T's are working in the Great Northern Leeds district.—[J. MOORE.]

G.N. 4-4-0 locomotives Nos. 3041 and 3049 are fitted with funnels of the "4630" type (2-6-0). In addition to Nos. 69 and 73, the following Darlington-built three-cylinder 2-6-0 locomotives have been seen in the London district (G.N. section):—Nos. 91, 92, 109, 112, 118 and No. 80. An old G.C. Sacré 2-4-0 tank locomotive, No. 450B, was recently at Stratford for scrapping.—[CECIL STEVENS.]

On the G.C. section of the L.N.E.R., G.N. "Atlantic" engines sometimes take the Grimsby–London fish trains in turn with G.C. 4-6-0 "mixed-traffics" and "Atlantics." Among those seen are Nos. 983, 985, 1431 and 1433. 2-6-0 No. 1074 also has been seen. N.E. locomotives regularly haul Great Central goods trains, among those seen being Nos. 757, 774, 775, 766, 923 4-6-0's and 1212, 1590, 1844 and 2390.—[J. TWELLS.]

S.R.

Nos. 331 and 333 (South Western section) large 4-6-0's have been rebuilt similar to the 473E's, with two cylinders and fitted with vacuum pump operated from the crosshead. These two engines, together with Nos. 524 and 707, have snifting valves on smokebox in S.E.C.R. style. No. 421 has lately returned from the shops with a six-wheeled tender and new-type funnel, similar to the old one, but without rim or capuchon. She is at present stationed at Eastleigh, but is understood to be going to S.E. & C. section. Her duties recently have been somewhat arduous, viz., 6.55 a.m. Eastleigh to Southampton, 7.20 boat train thence London, 11.30 a.m. to Bournemouth, 5.5 p.m. return, 10 p.m. down mails to Southampton, then light to shed, a distance of 386 miles—no inconsiderable mileage for a 4-4-0. No. 742, a large Urie, has been running for several months with a Maunsell-type superheater and indicator shields and all the paraphernalia relative to testing. She also has a new-type funnel, a replica of 790A's, the large S.E.C.R. 2-6-4 tank. Drummond tanks are being fitted with hand-rails to side tanks

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now, a feature much appreciated by enginemen. Several "E" section engines have appeared with new-type number plates of polished brass, but I have seen none on "A" or "B" sections with the exception of the Woolwich 2-6-0's, as the S.W. men call Mr. Maunsell's 810 class. I understand that the Western men like them because of their hill-climbing ability and haulage power. —[A. W. SMITH.]

Isle of Wight Railway locomotives have been renumbered in date order, the complete list now being: W.13, *Ryde* (1864); W.14, *Shanklin* (1864); W.15, *Ventnor* (1868); W.16, *Wroxall* (1872); W.17, *Brading* (1876); and W.18, *Bonchurch* (1883). *Sandown* was recently scrapped at Eastleigh, hence its absence from the series. When the Isle of Wight Railway was taken over by the L.S.W.R. in 1922, two of the late Mr. Adam's 0-4-4 tanks were fitted up with the Westinghouse brake and were sent over to the island. These were Nos. 206 and 211. They have been re-numbered W.19 and W.20. Two more of these locomotives are being similarly equipped for service in the island, and it is understood these will be re-numbered W.21 and W.22. It is not known whether Freshwater, Yarmouth and Newport Railway locomotive No. 1 has been repainted yet. This engine is a 0-6-0 saddle tank, and should be very useful as a shunter in the island, as it is fitted with the vacuum and Westinghouse brakes. These two brakes were very necessary, as about half the stock on the old F.Y. and N.R. was fitted with vacuum brake and the rest with Westinghouse, whilst a few vehicles were dual fitted. No. 2, the only other engine on the line (which was an old L.B.S.C. "Terrier"), was fitted with the vacuum brake only. This was due to the fact that the Freshwater people had purchased it in 1913 from the L. and S.W.R., who in turn had purchased it from the Brighton Railway. When this engine was repainted in Southern green the vacuum was removed in favour of the Westinghouse brake.—[R. A. WHEELER.]

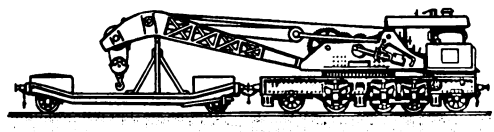
The latest engines of the "473" class of 4-6-0's, and the small superheated 4-4-0's of the Southern (South Western section) are fitted with snifting valves of South Eastern pattern.—[R. S. JOHN.]

No. 430, the last of the C.1 goods locomotives of the "Brighton" section, has been scrapped. 0-4-2T (D.1) No. 244 has rivets on the smokebox in the S.E.C.R. style. No. 136, Stroudley 0-6-0T, the last L.B.S.C. locomotive to bear a number plate, has been repainted and shorn of its plates. No. 305 (C.3), 0-6-0, has been specially painted in the new colours, with extra lining round cab. "Atlantic" No. 424 has been fitted with Ross valves, and B4x No. 70, which before rebuilding bore the name "Devonshire," has had the paint scraped off the left-hand splasher, clearly revealing the old name. E.5, 0-6-2T No. 400 works regularly on the S.E.C.R.—[M. D. ENGLAND.]

G.W.R.

Double-framed 0-6-0 pannier tank engines are generally used for Great Western rail-motors in the Plymouth district, but there are instances where even four-cylinder 4-6-0 locomotives take an odd turn on these duties, so that "Devonport Reader" is in error in claiming that these engines would only be seen attached to rail-motor vehicles in the course of shunting operations. Both "Star" and "Castle" class 4-6-0's have been seen on rail-motors working at Plympton.—[A. I. JEFFERY.]

M.S.W. 0-6-0 No. 21 has been rebuilt with a Great Western cab, coned boiler, &c., while her tender has been enlarged. She is numbered 1005. M.S.W. 4-4-4T No. 18 has been rebuilt with coned boiler, &c., and brought into Great Western standard, and is numbered 27. No. 2925 is stationed at Wolverhampton. No. 315 (Taff Vale No. 112) has been rebuilt with Great Western boiler, &c. She is of the 0-6-2T type. No. 161 0-6-2T (No. 21 Cardiff Valleys) has been rebuilt, and, judging from the length of the smokebox, has been fitted with superheater. Cambrian 0-4-4T No. 3 (G.W. 10), Cambrian No. 8 (G.W. 19), and Nos. 1110 and 1115 4-4-0 tender (formerly Cambrian Nos. 50 and 16) are at Swindon for rebuilding; also 0-8-2T Taff Vale No. 20 (G.W. 1378), Rhymney 0-6-0T Nos. 036 (G.W. 660) and 120 (G.W. 661). 0-6-2T "56" class are out from Swindon from Nos. 5600 to 5606.—[H. ROBINSON.]



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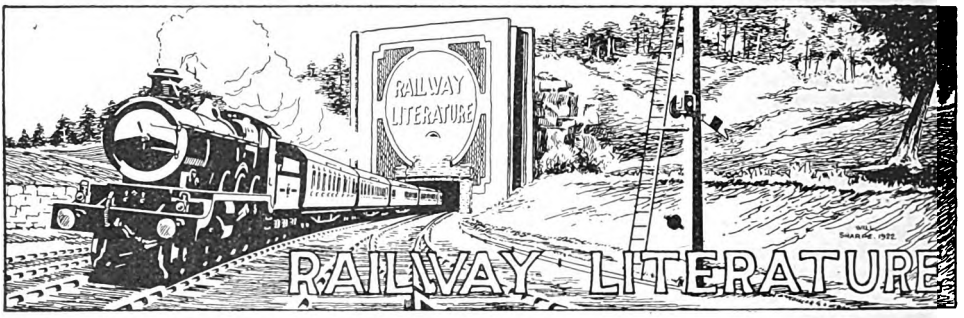

BITUMINOUS SUBSTANCES. By P. E. Spielmann, Ph.D., B.Sc., F.I.C., A.Inst.P. [Ernest Benn Limited, 8, Bouverie Street, London, E.C. 4. Price 15s. net.]

This volume, described as a scientific record of progress in regard to bituminous substances during the last 15 years, contains the results of all the most recent experiments and gives the standard methods of testing, tentatively established in the first instance by the Institute of Petroleum Technologists. A foreword is contributed by Mr. J. Kewley, Member of the Council of the Institute of Petroleum Technologists. There are six main sections, the first historical in character, while the four following ones deal, respectively, with the composition and origin; properties (physical and chemical); effects of heat, ageing, and solvents; and physical and chemical tests. These are followed by some concluding remarks and two appendices, one dealing with the nomenclature of bituminous substances and the other with the standard methods of testing as adopted by the Institute of Petroleum Technologists. The volume is completed by a useful bibliography, and name and subject-matter indices. Numerous tables, charts, drawings, and diagrams are included, so that this volume, which will, no doubt, appeal to readers associated with a wide variety of industries, will constitute a valuable reference work, particularly for those engaged in the manufacture of roofing felt, waterproof papers and fabrics, paints and protective coverings, electric insulating material, &c.

THE BRITISH OXYGEN CO. LTD. send a copy of their Catalogue No. 250, Sections 1 to 9. This relates to various applications of compressed oxygen and the appliances used in connection therewith, and with oxy-acetylene and other applications, and is, moreover, a splendid publication on its own account, containing a great deal of valuable information.

WE have received from Kynoch Limited and the King's Norton Metal Company (constituent companies of Nobel Industries Limited) a copy of "The Witton Book of Non-Ferrous Metals and Alloys." Whilst dealing very briefly with the historical and manufacturing side of the subject, the question of quality, testing, and specifications is dealt with at some length. At the end of the book are to be found a number of tables dealing with the weights of various non-ferrous metals in the different forms of strip, sheet, wire, rod, and circles. Quite apart from the subject-matter, the tables alone will appeal strongly to those handling non-ferrous metals and alloys. Several full-page illustrations are included. A copy of this useful treatise may be obtained from the publishers, Kynoch Limited, Witton, Birmingham, by mentioning this paper.

MORE SONGS FROM THE MOORLAND. By May I. E. Dolphin. [Oxford: Basil Blackwell, Broad Street. 99 pp. Price 3s. 6d. net; boards, 5s. net; postage 4d.]

Nature lovers will find much to interest, charm, and amuse them in this little work—many fine thoughts beautifully expressed, a keen insight into the affairs of life, and a fund of quiet humour not always associated with the poetic muse. Readers more particularly interested in railways as we are will note with interest that the book contains three poems devoted to the iron horse, though we are bound to admit that we like these least of any in the book. The poems in question are "The Song of the Train" (page 21); "Murton Junction" (page 33); and "Voices in a Train" (page 79). Of the three the best is, perhaps, the second—it is concerned with the story of "a hero born of the people"—but the first runs it pretty close, though in a different way, in point of interest and merit. But, as we have indicated, we like Mrs. Dolphin best when she sings of trees and flowers and birds, and of these and kindred objects there are many notable passages within the covers of this pleasant little book.

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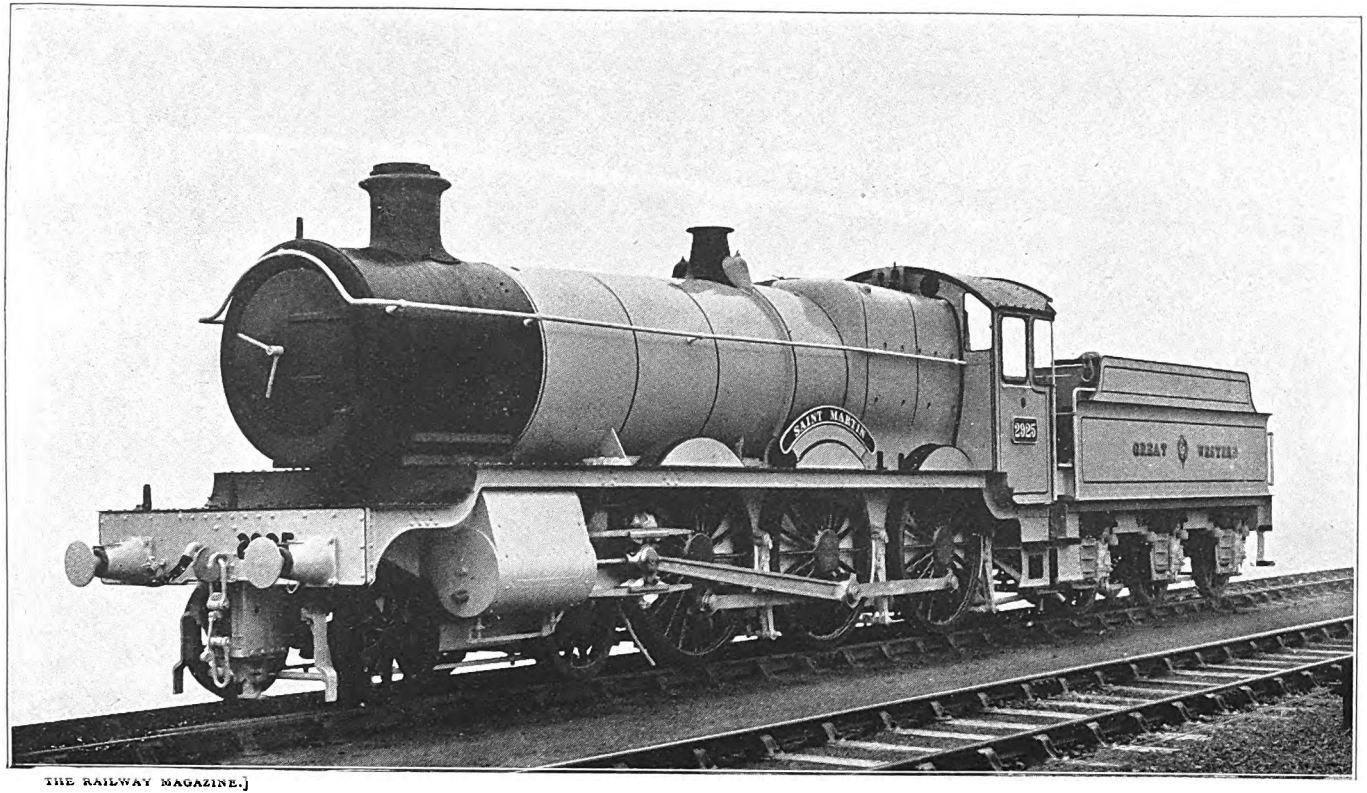

THE RAILWAY MAGAZINE.]

REBUILT 4-6-0 LOCOMOTIVE, GREAT WESTERN RAILWAY.

Mr. C. B. Collett, O.B.E., Chief Mechanical Engineer.

Cylinders, 18½ in. × 30 in. **Coupled Wheels, 6 ft. diam.** **Bogie Wheels, 3 ft. 2 in. diam.**
Heating Surface: Fire Tubes (176), 1686·60 sq. ft.; Firebox, 154·78 sq. ft.; Superheater, 262·62 sq. ft.; Total, 2,104 sq. ft.
Grate Area, 27·07 sq. ft. **Steam Pressure, 225 lbs. per sq. in.** **Tractive Effort, 27,275 lbs.**
Adhesion Weight, 54 tons 18 cwts. **Weight in Working Order: Engine, 72 tons 10 cwts.; Engine and Tender, 112 tons 10 cwts.**

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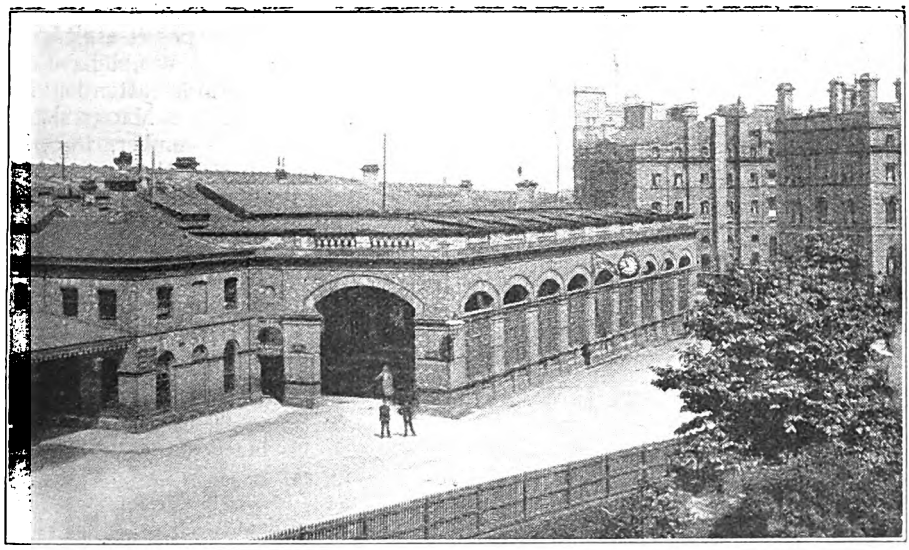

GENERAL VIEW OF YORK STATION AND L.N.E.R. HOTEL.

Notable Railway Stations and their Traffic.

YORK, LONDON AND NORTH EASTERN RAILWAY.

By J. F. GAIRNS, M.Inst.T., M.I.Loco.E.

FOR a long period York station claimed equal honours with Carlisle (Citadel) in that both of them provided the only instances in Great Britain where seven distinct railway companies operated trains into and out of the station by means of their own locomotives. A dozen or so years back, however, the London and North Western ceased to work trains into York by means of its own engines, handing over most of its through trains to North Eastern locomotives at Leeds, though its vehicles continued to work through not merely to York, but also to various parts of the North Eastern system. While from that time York thus provided accommodation for the locomotives of six railways only—North Eastern, Great Northern, Great Eastern, Midland, Great Central, and Lancashire and Yorkshire—it has for many decades been a centre for through traffic on a scale which is probably barely approached, and certainly not equalled, by any other station in Great Britain. Moreover, while the locomotives of six railways only were to be seen at York, the variety of rolling-stock has come to include that of several other companies, notably the London and North Western and the Great Western, but also the London and South Western and occasionally other lines. York is one of the most remarkable centres of traffic, also by reason of the fact that so many through services make it an important interchange point, while numerous branches radiate in various directions. A further notable feature is that, while it accommodated "foreign" locomotives and rolling-stock on so generous a scale, the station itself belonged to one company only, the North Eastern, while approach to York from every direction involved traverse of North Eastern metals for a considerable distance.

As a result of grouping, the situation is altered in some respects, in that the North Eastern, Great Northern, Great Eastern, and Great Central now form part of the London and North Eastern Railway, so

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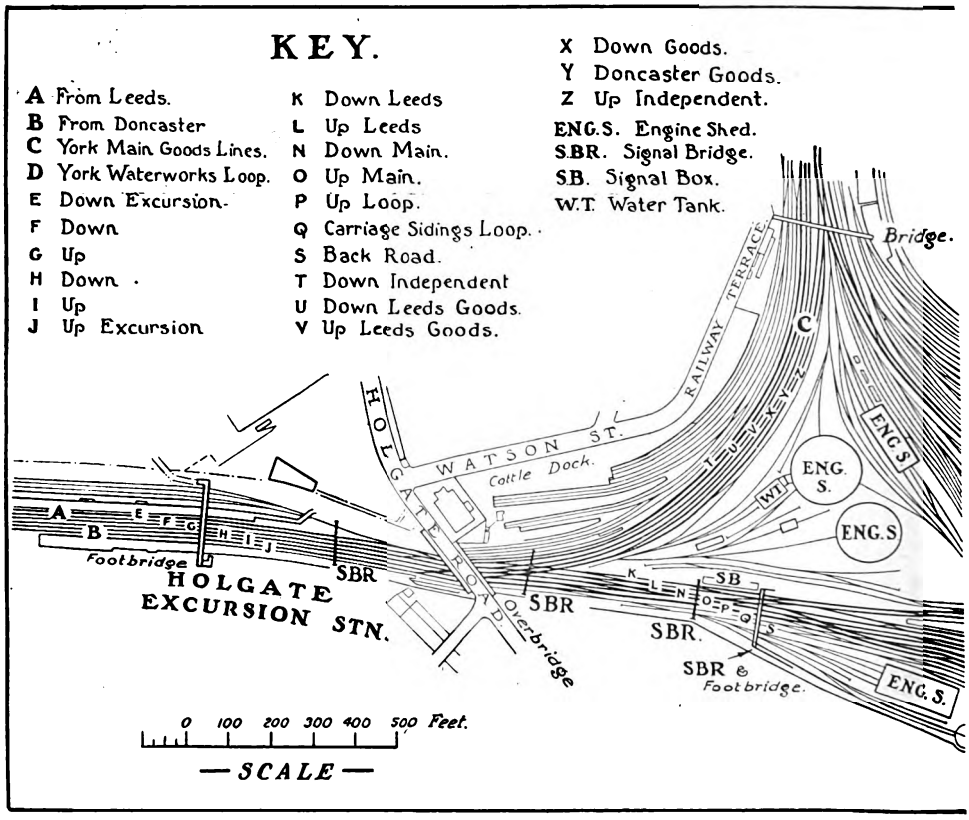
that each section has, as it were, equal rights of user of York station, while the Midland and Lancashire and Yorkshire, together with the London and North Western, now constitute part of one system—the London Midland and Scottish Railway. As a result, only the two great group companies are now concerned at York, the one as the owner and the other as a visitor. As, however, trains of the respective sections of the two great railways of to-day are still largely operated with locomotives and vehicles belonging to the sections concerned, while changes in train services have as yet been modified only in relatively small respects, the situation, as a whole, is not altered appreciably from that which applied when the various railways were independent, so far as train-operating arrangements are concerned, if not in regard to commercial aspects.

In view of the exceptional importance and special operating and traffic interest which York station possesses, it is only to be expected that it would have already received considerable attention in the pages of the RAILWAY MAGAZINE. Thus, as long ago as December, 1899, it was described as No. 2 in the original series of "Notable Railway Station" articles; in the issues for October, November, and December, 1908, and January, 1909, the late Rev. W. J. Scott contributed articles under the heading of "York as a Railway Centre," and in the numbers for November, 1911, and January, 1912, Mr. T. Preston described the Locomotive Yard signal-box, including reference to the signalling at York station and the changes and developments made in 1910–11. These changes had an important influence upon the station as a whole, and, as Mr. Scott's articles were concerned mainly with the traffic features (although they included some reference to the station and its operation), the time which has elapsed



GENERAL PLAN OF LINES,

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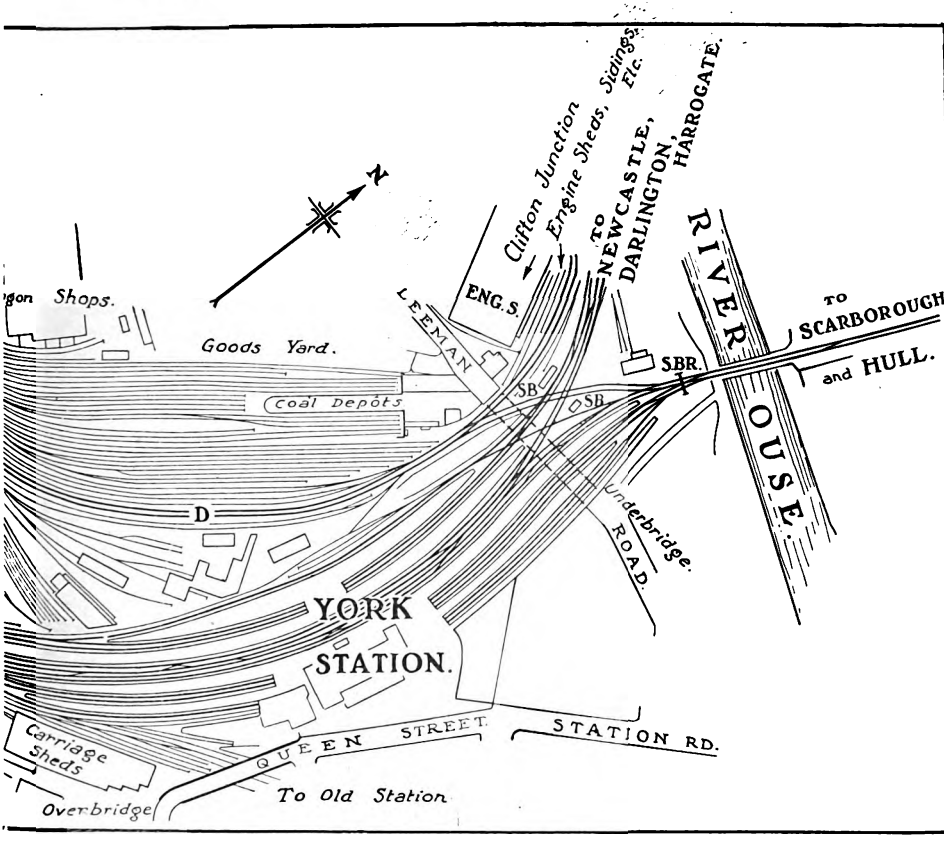
since the 1899 article justifies a new one. In this connection the writer has to acknowledge the courteous co-operation of officers of the London and North Eastern Railway, and particularly of Mr. F. Wheddon, who now occupies the position of station master at York.

Before dealing with the station in detail, a few remarks in regard to the railway lay-out and to historical aspects are necessary. From the south all traffic approaches either *via* the route from Church Fenton, from Leeds, Normanton, &c., or *via* Selby.

By the former, four track from Church Fenton, trains reach York from the Leeds direction (including those through to and from the L.N.W. section of the L.M.S.R.), together with trains from the late Midland, Lancashire and Yorkshire, and Great Central lines. The Selby and Doncaster route, used by Great Northern, Great Eastern, and certain North Eastern trains, is two-track to Chaloner Whin Junction, some two miles south of York, where connection is made with the Church Fenton route. Interchange connections are provided so that trains can use either pair of metals between the junction and York station, though, speaking generally, the eastern lines are reserved for Selby route trains and the western pair for trains *via* Church Fenton, except in cases where two trains are scheduled to make use of the four-track facilities to and from Church Fenton and to run more or less side by side. For convenience the respective lines between York and Chaloner Whin Junction are usually described as "Up and Down Doncaster" and "Up and Down Leeds."

At Holgate Bridge Junction goods lines diverge to the west, curving round to join at North Junction goods lines connecting with the main and Scarborough lines from the north, thus constituting a triangle.



CONNECTIONS, ETC., AT YORK.

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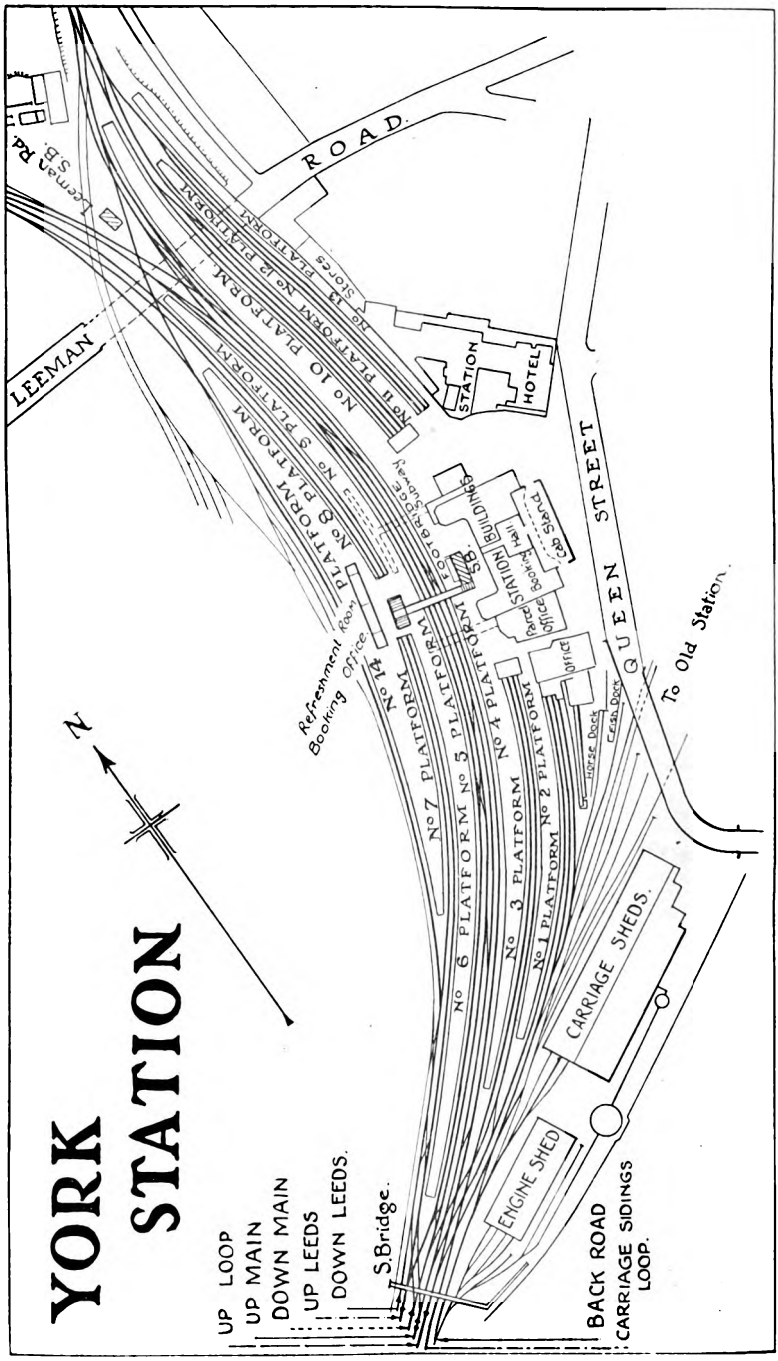

PLAN OF YORK STATION, SHOWING PLATFORMS, ETC.

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Beyond North Junction the goods lines continue, joining at Severus Junction the lines serving the extensive goods station at York, and run on to Poppleton Junction, where connection is made with the main line through York passenger station. Other features of the lay-out are that the Scarborough and Hull branches diverge immediately from the main line at the north end of York passenger station, certain platforms being, in fact, so located that they can be used only by trains in the Scarborough or Hull directions.

Near the point where the goods line connection from North Junction rejoins the main line at Clifton Junction are extensive carriage and other sidings on either side of the main line, together with the engine shed, where as many as 200 locomotives are sometimes accommodated; Poppleton Junction controls divergence to the Knaresborough line, as well as to the main line north; at Burton Lane Junction, 69 chains along the Scarborough line, a branch is put off to serve the Foss Islands goods station and to make connection with the Derwent Valley Light Railway; and at Bootham Junction, 50 chains beyond Burton Lane Junction, the Market Weighton branch leaves the Scarborough line for Hull and other destinations.

By means of the diverging goods lines from Holgate Bridge Junction it is possible for all goods traffic to be kept clear of the passenger station, a practice which is rigidly adhered to at all busy periods, and which is departed from only at times when an occasional goods train can be conveniently run through the passenger station, and in regard to certain through express freight trains mostly run during the night. Adjacent to these goods lines there are, of necessity, extensive sidings, some providing for sorting and remarshalling, in addition to those associated with the York warehouse and tranship shed.

The only drawback is that goods trains in the Scarborough and Market Weighton direction necessarily cross the main line immediately to the north of the passenger station. Except for these, however, it is usually practicable to operate virtually the whole of the goods traffic without affecting working in the passenger station, goods traffic being, in fact, to all intents and purposes, clear of passenger traffic until connection is made again at Poppleton Junction. Even there, indeed, separate goods lines are still available for some distance, so that it is not until some miles northwards that goods traffic is again intermixed with the passenger trains, so far as the main line is concerned. In practice, except for the goods trains mentioned as crossing the main line north of the station, the so-called goods lines from North Junction to Clifton Junction are used for freight traffic to a limited extent only, these tracks being more generally utilised for engines passing to and from the engine sheds at Clifton Junction, for turning main line engines by means of the triangle constituted by Holgate Bridge, North and Clifton Junctions, and for the working of empty passenger stock and other purposes associated with traffic operation in connection with the station.

Although so much of its traffic is of a through character, until comparatively recently York suffered somewhat from the drawback that it had two through platforms only, with two middle lines between, while even now these are increased only by No. 14, built outside the station proper. This was erected to meet traffic needs when the Royal Agricultural Show was held at York some twenty or so years ago, and still retains certain temporary characteristics, though for a long period it has constituted an essential factor in the successful operation of heavy and complicated traffic. Both of the main through platforms are, however, of exceptional length, including extensions added at various periods. The longest, No. 4 Up, is, in fact, no less than 1,692 ft., the length of No. 5 being 1,575 ft. Platforms Nos. 4 and 5 are, however, adapted to accommodate two trains simultaneously, "scissors" cross-overs being provided about midway between the respective platforms and the adjacent through lines. It is thus possible for a train standing at the rear part of a platform to leave while the front portion is occupied by another train, or for a train to reach the front portion of a platform while the rear section is occupied. In these days of very heavy trains, however, it is occasionally necessary to devote the whole of a platform to one train, in that its length would entail fouling the intermediate crossings. Fortunately, such

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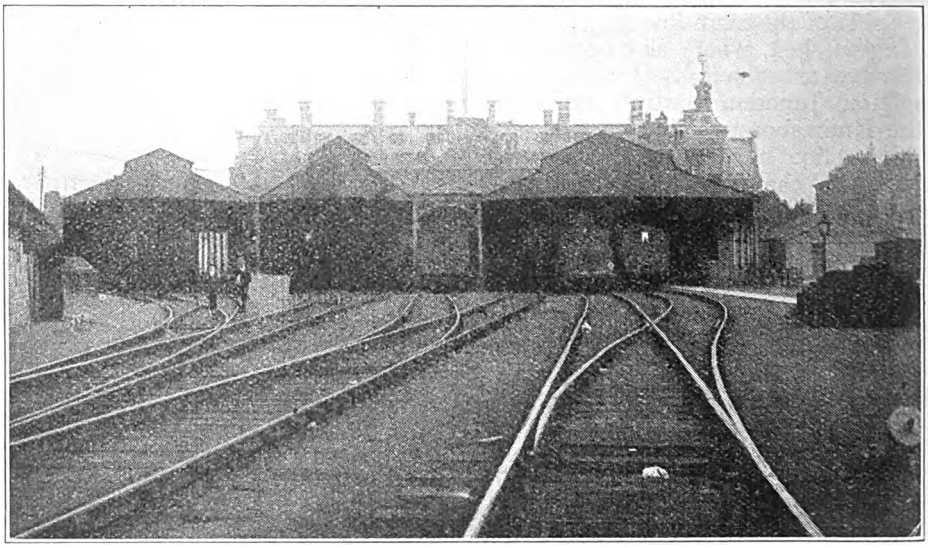
trains are still somewhat infrequent, so that when they are run suitable arrangements can be made for their reception.

At the south end there are, on the up side, two terminal platform lines, Nos. 3 and 2, and beyond the latter is a platform serving No. 1. On the down side, between Nos. 5 and 14, are two terminal lines, platforms Nos. 6 and 7.

At the north end there are two terminal lines between Nos. 5 and 14, Nos. 8 and 9, respectively.

On the east of No. 4 are Nos. 10 and 11, with a middle road, and 12 and 13.

special traffic manipulation in the way of sidings, though at Clifton Junction extensive provision for dealing with coaching stock is available, and to some extent the connection towards North Junction can be utilised. South of the station, however, the 4-track approach includes outer lines, one denoted "Down Excursion" and the other "Up Excursion," each alongside a platform known as Holgate Bridge, which can be used, if required, for detraining and entraining passengers on special occasions, the principal being York races and events of that character.



OLD STATION AT YORK, NOW USED FOR STABLING TRAINS.

The latter platforms curve towards the Scarborough line and are necessarily reserved for trains routed in that direction. Part of No. 4 is, in fact, curved to suit the Scarborough line, so that while its rear portion can be used by trains from the Scarborough line, main line trains, if using the rear part, must be of restricted length.

Except for a passing line, used in one direction only, beyond No. 14 platform, there are thus only Nos. 4, 5 and 14 platform lines, and the two middle lines between Nos. 4 and 5, available for through movements. North of the station, indeed, there is very little accommodation for

There are thus six tracks for the use of trains to and from York at the south end. All of them, it may be pointed out incidentally, give connections to six lines towards North Junction, which are concerned mainly with goods traffic. These tracks are generally described as "Up Independent," "Up Doncaster Goods," "Down Doncaster Goods," "Up Leeds Goods," "Down Leeds Goods," and "Down Independent." The general characteristics of traffic allocation along the Chaloner Whin-York section are therefore, to a certain extent, maintained for some distance along the goods lines. Several carriage lines and sidings served

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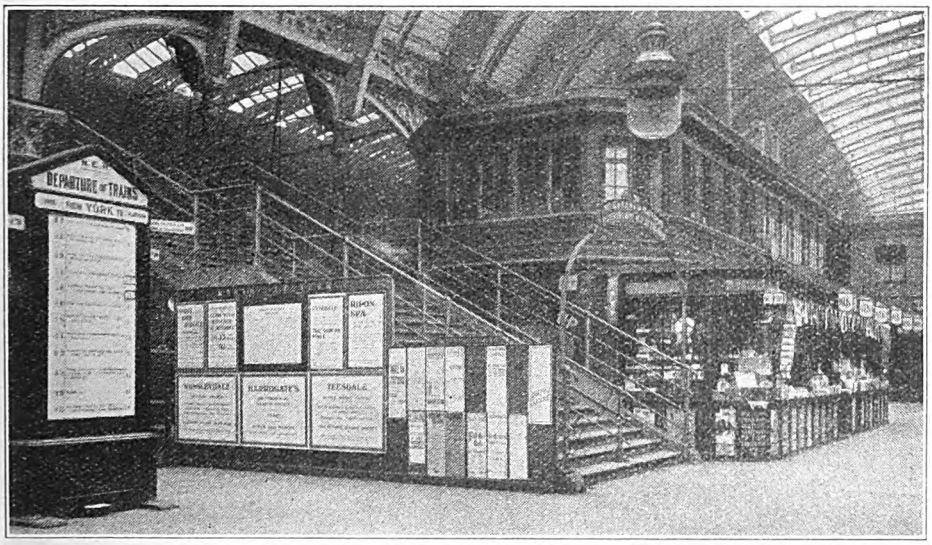
from Nos. 7 and 14 platform lines and from the through line beyond No. 14, which is generally described as an engine line, may also be noted. The sidings mentioned also serve for the reception of engines reversing at York, but not stationed there, thus giving a name to the big signal-box at this end of the station known as the Locomotive Yard box. Near by are two engine sheds, the "Great Northern" (now used by various L.N.E. locomotives) and the "Midland" (now shared by L.M.S. and L.N.E. engines).

On the up side there is more generous provision for miscellaneous purposes, in that adjacent to No. 1 platform is a carriage siding, and beyond it are horse and carriage landing docks and sidings. Close by is the old station, now used for carriage shed and other purposes. The old city wall, the top of which for some distance near the station is laid out as a public walk, was pierced to enable trains to pass through an archway to reach the old station, which was thus within the city walls, whereas the present station is just outside. At about the point where the old station lines connect there is also provided a small engine shed, known as Queen Street shed, at which locomotives belonging to "foreign" companies stationed at York were accommodated, though since grouping this applies only to L.M.S. engines and to L.N.E. locomotives which are stationed there for convenience instead of at Clifton Junction. Adjacent are various premises, some utilising what were at one time the old railway workshops, and others erected on space available to meet the needs of various departments. Certain of these buildings, it may be mentioned, now accommodate the more bulky items of the collection of relics of historic interest which the London and North Eastern Railway has been accumulating to form the nucleus of a railway museum. Many of these will be shown at Darlington in connection with the Railway Centenary celebrations, together with articles of a similar character which are preserved in the general offices a short distance within the walls.



BOOKSTALL AND STEPS TO FOOTBRIDGE FROM PRINCIPAL CIRCULATING AREA.

While speaking of the old station at York, we would state that the *North Eastern and Scottish Magazine* recently reproduced a plan showing the station as used during the 1841-77 period, presumably including developments in later years, together with a view of the old station buildings. As explained by our contemporary, the first station at York was a temporary one, situated in Queen's Street a little beyond where York Railway Institute now stands. It was the first

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station proper possessed by York, and was opened on January 4, 1841, for the joint use of the York and North Midland and Great North of England Railways. It remained in active use until the present station was opened on June 25, 1877. The old station is now used for standage purposes, and its former waiting rooms, offices, &c., accommodate the staff of the chief engineer. Interesting Roman remains were found when the foundations of the station were being dug, and also of the Priory which formerly stood hereabouts, nearly coinciding, in fact, with the site of the station.

In this connection it is interesting to note that in the basement under the present entrance to the old station there still exists a well of cool, sparkling water. It is more than likely this is the same source of supply as that which served the Romans.

In that the working of traffic at York is so closely associated with the approaches, it is not surprising that the jurisdiction of the York station master extends as far as Chaloner Whin Junction cabin south and northwards to Poppleton Junction in the one direction, and to Bootham Junction in the other, though it does not include North and Severus Junctions, both of which are more particularly associated with the working of goods traffic. At Chaloner Whin complete interchanges are practicable between the two Selby and the four Church Fenton lines. The box is therefore an important one, with 110 levers. Thence to York trains to or from either route can use either of the up and down lines available, and approaching Holgate Bridge the "up excursion" and "down excursion" lines already mentioned provide further relief. Intermediately, however, there is a box known as Dringhouses, with 21 levers, and a box known as South Points, with 60 levers. At Holgate Bridge there is a small box with six levers, and the groundman employed there is responsible for advising Locomotive Yard when trains passing into the goods marshalling yard have passed in clear with tail lamp complete. The chief burden of York traffic at the south end is, however, borne by Locomotive Yard box, which has no fewer than 295 levers, arranged in one continuous bank, rendering it one of the most remarkable manual boxes in the world. It controls connections to and from the goods lines and all traffic within and about station limits at the south end. This box, which is placed parallel to the running lines, is usually worked under the charge of a regulator, for whose benefit a

GENERAL VIEW OF No. 4 PLATFORM, LOOKING SOUTH.

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small sheltered platform projects about midway along the box. He is thus given a good view of all that goes on within his range of vision, and is able to instruct the five men usually at the levers as to the movements required.

A special feature of this, as also of the other boxes associated with the station work, is that at suitable positions about the station electrical indicating devices are provided, so that all standard movements can thus be indicated to the Locomotive Yard box and supplemented, if required, by telephonic conversation. At York, therefore, there is the almost unique peculiarity of a heavy and complicated traffic associated with a large station carried on with never the sound of an engine whistle. Thus, on the arrival of a train which has to change engines, and in some instances transfer one or more vehicles, the platform inspector signals to the cabin when the engine (or engine and vehicles) has been uncoupled; the desired movement is necessarily in full view of the regulator, who then has the road set for a new engine (or engine and vehicles), placed ready by that time to back on to the train; simultaneously, or when practicable, the first engine (or engine and vehicles) is sent as required, and when the main train is ready to depart a signal is given from the platform to the box to that effect. As most of the movements made are standard or scheduled as special instructions, there is usually no need for further explanation than can be given by indicators, but, when necessary, additional particulars can be communicated by telephone. Owing to the curve of the long platforms and the many obstructions to the view which may be involved, electric bell communication is provided at several places along the main platforms, so that the driver and front guard can be made aware by the rear guard or a platform inspector farther back that work at the rear is finished and that the "right away" signal can be given so far as the back part of the train is concerned.

GENERAL VIEW OF No. 4 PLATFORM, LOOKING NORTH.

The "heart of things" is, however, the Platform box, with 80 levers, located on No. 4 platform, immediately over the bookstall and adjacent to the footbridge connecting Nos. 4 and 5 platforms. This box controls the "scissors" crossings in the middle of the station, and is therefore principally concerned in shunting operations and as regards movements of trains between the front and rear sections of each of the principal through lines and of the middle lines. Even from this box, however, the view of what is going on is liable to be obstructed at times, so that some

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of the sections, particularly those to the south, are protected by track-circuit operating indicators in this box. While its scope is somewhat limited, this box affords, however, the most convenient point from which to oversee station working as a whole, and as it is in communication with the telegraph office, by which information as to the loading and running of trains in all directions can be obtained, it is usual, if trains are seriously out of order and at exceptional periods, such as those associated with public holidays, for the station master or an assistant station master to take charge personally in the box and act as "controller."

levers, arranged in two frames, one on each side. Opposite is Leeman Road box, controlling exclusively platforms 14, 8 and 9, and the connections from North Junction, being concerned also, in association with Waterworks box, in goods traffic across the main line. To a great extent, however, Leeman Road is controlled by Waterworks, in that the latter is responsible so far as the arrival and departure of trains is concerned, though the details of station working are covered by Leeman Road as regards that part of the station over which it has direct control. Leeman Road box has 91 levers.

Farther along is Clifton Junction box,

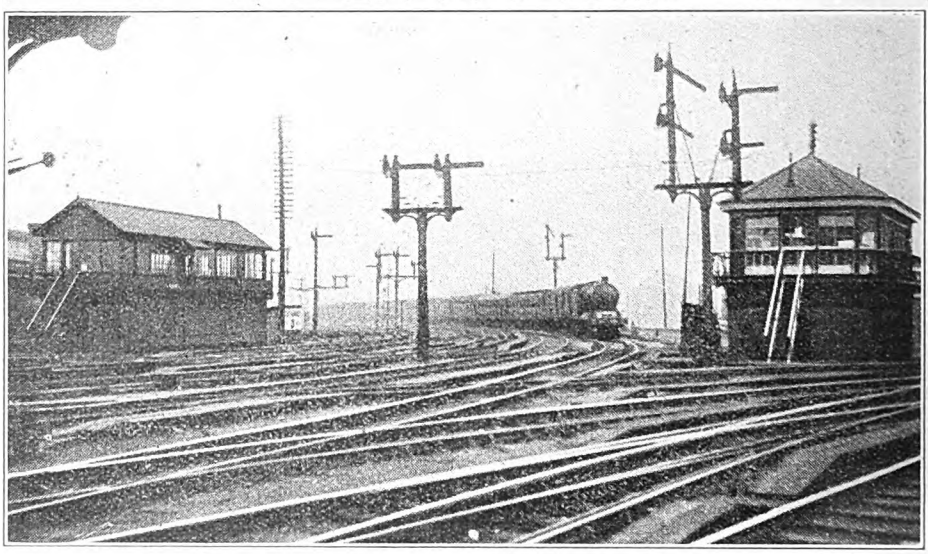

Photo.] [*E. M. Bywell.*

TRAIN APPROACHING FROM NORTH BETWEEN LEEMAN ROAD (LEFT) AND WATERWORKS (RIGHT) SIGNAL-BOXES.

At the north end of the station there is the somewhat unique situation of two signal-boxes within a stone's throw of one another, located one on either side of the four tracks, yet in block communication with one another. They are, indeed, so close together that it is frequently possible for the men to converse across the line instead of telephonically, so far as such communication may become necessary. The larger and more important of these boxes is located in the angle between the main and Scarborough lines, and is known as "Waterworks." Here there are 132

with 120 levers, controlling the engine shed approaches and the sidings on either side of the running lines. Of these sidings those on the down side are more particularly reserved for carriage storage and marshalling, while the ones on the up side are largely used for dealing with fruit, fish and other traffic which has to be transhipped or re-marshalled as part of the work at York. Poppleton Junction box is also under the jurisdiction of the York station master, in that it forms the northward limit of the area directly associated with traffic operation at York.

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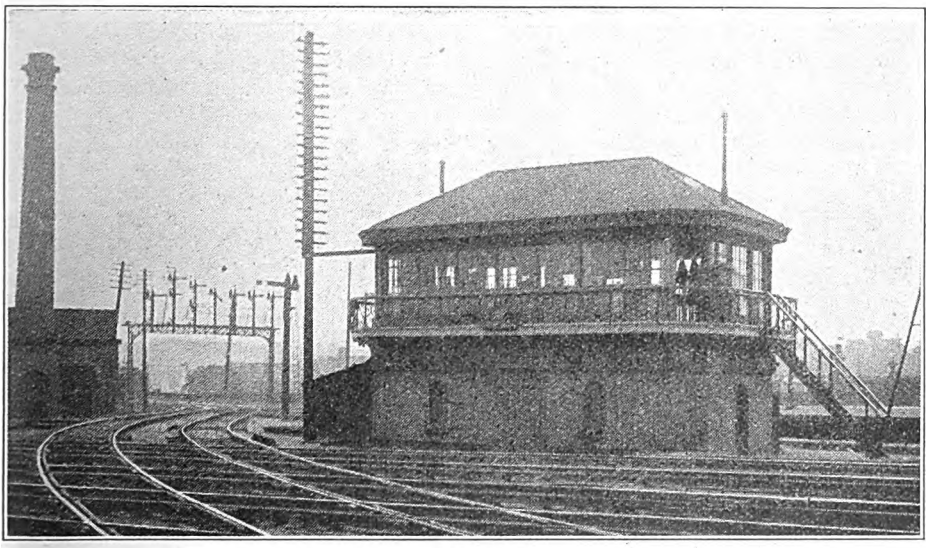
There are 90 levers in this box. Along the Scarborough line there is a small box, with 33 levers, at Burton Lane Junction, controlling the branch to Foss Islands goods depot. This branch is single-track, controlled by train staff, but of considerable importance, in that much of the cattle traffic handled at York passes over it, while it also gives access to the works of Messrs. Rowntree and other industrial establishments. Finally, Bootham Junction (31 levers) controls the Scarborough and Market Weighton routes.

Signalling at York is entirely mechanical, with, however, very complete interlocking and full provision of indicators and other appliances to facilitate the working of traffic. To a considerable degree, too, the respective cabins control one another, so far as their inter-working is concerned. Trains approaching from the north are controlled by various types of bracket posts, with a bridge of signals on the Scarborough line. Most of the departure signals at the north end are in bracket groups, and in some instances their application is not immediately obvious, though necessarily they are entirely familiar to drivers. This is due, however, mainly to sighting considerations arising from the fact that the approach is round a long curve and that the station itself has a curved layout. At the south end much of the signalling is concentrated on various bridges, several of which are erected within or immediately outside the station proper, with others extending to and beyond Holgate Bridge platforms. An important feature of the signalling at York is the extensive provision of shunt signals, both semaphore and disc, so that practically every movement is made under signal direction.

Reference to a plan published in the 1899 article will show that, at that time, No. 14 platform had not been constructed, while in Mr. Preston's article (published in the 1911 and 1912 issues), previously mentioned, a plan was included showing a somewhat different arrangement at the south end. At that period traffic at the south end was controlled by two signal-boxes, one of these bearing the same name as that given to the modern Locomotive Yard box, brought into use in 1909 in connection with track alterations, improved signalling, and platform extensions. The other box, Holgate Bridge, was located near the "Excursion" platforms, most of its working having been incorporated in the enlarged Locomotive Yard box.



WATERWORKS SIGNAL-BOX, SHOWING LEVEL CROSSING FROM GOODS YARD TO SCARBOROUGH AND HULL LINE.

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A notable feature of traffic working at York is that each of the through platforms can be used for trains in either direction. In fact, it is possible to work either up or down trains from or to either No. 4 North or No. 4 South, or No. 5 North or No. 5 South, providing that the movements do not conflict, while No. 14 can be used for up or down trains as required, though in that case there is no intermediate division. The general allocation is, however, that Nos. 14 and 5 are the through down platforms, and No. 4 the through up platform, while the middle lines are generally treated as down through and up through respectively, except when concerned in opposite direction movements to or from platforms.

While the passenger train traffic is necessarily very complex, involving the frequent transfer and interchange of through coaches, and sometimes the division or combination of composite trains, this is added to by the considerable numbers of vans, both through and terminating, attached to various trains. Mail and parcel post traffic is a heavy item, with many complex features, in that, particularly for parcel post purposes, but also to some extent in connection with mail traffic, a great deal of transhipping and handling is necessary. On occasions, in fact, as many as 5,000 parcel post packages may be required to be handled in 24 hours, apart from those on trains passing through York. There are also considerable numbers of vans for luggage (in summer including "luggage in advance") and parcels traffic, many involving shunting and transfer from one train to another, and an appreciable proportion of the parcels requiring transhipping. At times it is necessary to run special parcels trains, which may or may not involve re-marshalling, and/or transhipping of the parcels at York, while horse-box, fast fish and other trains, either on standard or special schedules, have frequently to be dealt with.

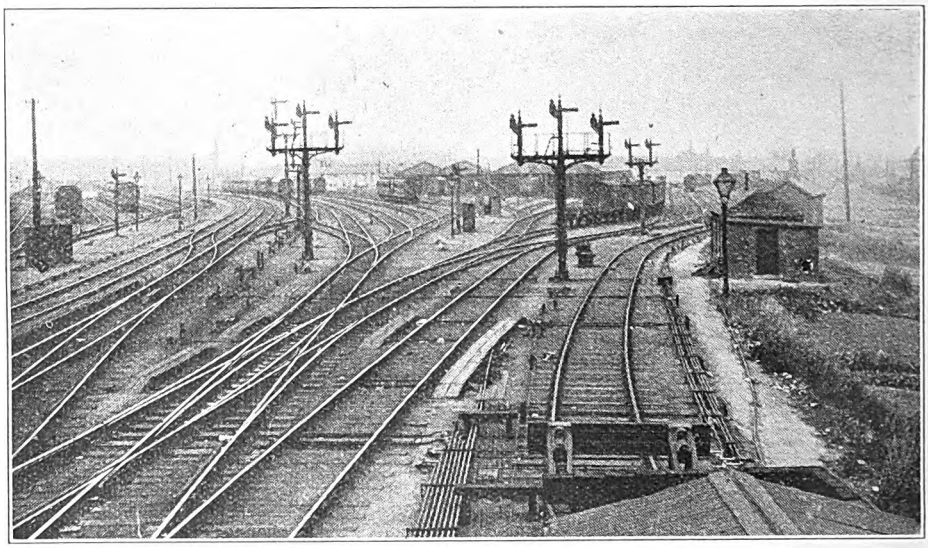

Photo.] GENERAL VIEW AT CLIFTON JUNCTION. [*E. M. Bywell.*

During the respective seasons fruit traffic is a heavy item, including considerable numbers of through vans, while large quantities of fruit require to be transhipped. Re-marshalling of vehicles is at times performed in the station, but, as far as possible, is dealt with in the sidings at Clifton Junction. As showing the proportions to which this traffic attains, it may be mentioned that, from June 28 to August 31 of last year, no fewer than 1,883 fruit vans were worked on special trains and 975 on ordinary trains. Of this total of 2,858 vehicles, 2,690 were sent forward,

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the remainder terminating at York, though many of those which proceeded had had their contents transhipped and re-classified to a considerable degree. Fish specials are usually dealt with in the Clifton Junction sidings, but it is not possible to keep this traffic entirely clear of that in the passenger station.

Another special feature is the large volume of horse traffic, York being a big centre for horse sales. As it is also a racing centre there is much special horse-box traffic, while similar traffic due to various racing centres in the district has its effect upon work at York. Some 5,000 horses are usually loaded or unloaded at York in the course of a year.

Racehorse traffic is both loaded and unloaded at a dock which is provided at the south end of the Goods Marshalling Yard, known by the name of the Dringhouses Up Yard. This dock was first used on the occasion of the August races in 1922, and has proved of considerable benefit to owners and trainers as the use of the dock avoids the animals having to be walked through the streets of York. The Dringhouses Dock is quite near to the Knavesmire, where the races are run.

A certain amount of milk traffic is also dealt with, some 7,600 churns being received in a period of twelve months, and about 2,200 forwarded. The working of saloons is at times a very heavy item at York. These include those chartered for beanfeasts and staff outings and for pleasure purposes generally, and at certain periods there may be as many as 300 such vehicles, some requiring transfer from one train to another, in the course of 24 hours.

In a normal day 96 trains start from York and 95 terminate there, while 55 are through trains. At pressure periods, however, these figures may be increased by from 100 to 150, and as not infrequently a considerable proportion of these trains are of maximum length, the problems of dealing with them in the station are not always easily solved. Notwithstanding the fact that York is essentially an interchange station and traffic centre, as the town has a population of some 80,000 and has many attractions for the tourist, the work originating at the station is by no means inconsiderable. Thus, in 1923, 654,000 passengers were booked, 168,000 parcels forwarded, 203,000 received, and about 3,000,000 transferred.

The station dates from 1877, and is distinguished by the portico which covers the station yard proper. The latter gives access to a spacious booking hall, and thence through an archway to the main circulating area about midway along No. 4 platform. Opposite is a stairway leading to the wide footbridge connecting the two parts of the station. Below the station box is a large bookstall, while located around the circulating area on No. 4 platform may be noted, on one side, the luggage and cloakroom departments and the station master's offices, and, on the other, waiting, refreshment and dining rooms. Farther along, to the south, are other staff offices, and at the back of No. 1 platform are the offices of the London Midland and Scottish Railway's agent and the staff employed by that company for dealing with commercial aspects of L.M.S. passenger and parcels work. Near by may be noted a cycle store and premises associated with the parcels department, the public entrance to which is outside the station, adjoining the south side of the portico ; also various staff offices. Farther along the platform, towards the north, is a very fine tearoom, having access also from outside the station, and close to this is an entrance from the station direct to the railway company's hotel adjacent. No. 5 platform also has a circulating area providing for distribution to the terminal platforms north and south on that side, as well as giving access through openings to No. 14 platform, which is beyond the all-over roof which covers a great part of the main station. Waiting and refreshment rooms are also provided on that side.

The station fronts upon a thoroughfare, along which the York Corporation tramways run, with public gardens at the foot of the city wall adjacent. On top of the wall is a public walk, as already mentioned, and from this splendid views are had of the station and of the hotel. Just beyond the first range of the gardens the public road passes through an archway cut in the city wall, and just beyond this is the splendid block of buildings erected by the North Eastern Railway Company for administration purposes. Opposite this is the War Memorial in memory of North

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Eastern Railway employees who gave their lives during the Great War.

With traffic of so elaborate and complex a character, it is neither practicable nor necessary to describe working at York in detail, in regard to which readers may be referred to *Bradshaw*, on so many pages of which the name of York appears.

So far as practicable, special down through trains, such as the East Coast expresses from King's Cross and the through trains from Liverpool and Manchester *via* either the Lancashire and Yorkshire or the London and North Western route, as also trains such as the 8.55 a.m. Leeds–Glasgow express, are dealt with at No. 5 or at No. 14 platform. Most of these trains involve a change of engines. Similar arrangements are also made in regard to numerous ordinary and special trains from various directions to Scarborough and Whitby. These trains, particularly those to Scarborough, are very numerous during the summer season, and are frequently full-length. Occasionally they are worked through by engines from the section whence they originate, but, as a rule, North Eastern engines take them on at York, if not at Leeds or other convenient centre. If need be, however, and No. 5 is available, such trains are at times sent across to No. 4 platform. Similarly, while No. 4 is the principal up platform, it is practicable to use either section of No. 5 or No. 14 to relieve No. 4.

A few trains, such as the 9.50 a.m. and 1.15 and 5.30 p.m. from King's Cross, and the 8.5 a.m. from Newcastle, are not booked to call at York. These are passed, if practicable, over one of the middle lines, but in several instances they actually stop for engine changing, though certain trains are booked to do this at Clifton Junction, adjacent to the engine sheds, instead of in the station. These arrangements apply exclusively during the summer months, the winter schedules not including any instance of a train publicly booked to pass York without calling, though this is by no means unusual in the case of specials and reliefs. Although booked as independent trains, there are a number of instances where trains, say, from Scarborough, are worked to a through platform and leave again for Leeds or other south destination after a stay of ten minutes or so. Otherwise, trains other than through ones are principally dealt with at the bay platforms, all of which are signalled for both arrival and departure.

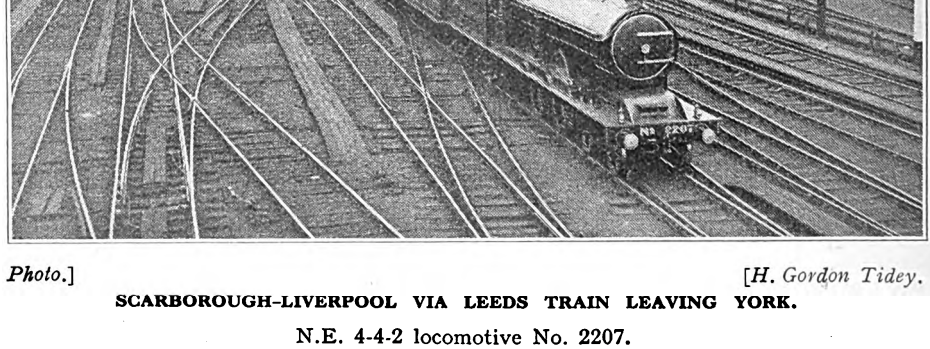

Photo.] [*H. Gordon Tidey.*

SCARBOROUGH–LIVERPOOL VIA LEEDS TRAIN LEAVING YORK.

N.E. 4-4-2 locomotive No. 2207.

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A feature of the working, entirely a modern development, is the number of rail motor 'bus services which are now run on several routes radiating from York. One of these utilises the smallest of these vehicles as used in the York district, though it puts in one appearance only at York station in the course of a day. This diminutive vehicle comes in at 9.51 a.m. from Selby and returns at 10.30 a.m. When seen at a platform in York station, where it can be compared with an ordinary train, the difference in size is striking.

Among interesting features of traffic working at York a few items may be selected from the arrangements in force during the summer period of last year, particular attention being given to the transfers of vehicles and through sections. In order to associate the evening and night services the day may be regarded as commencing at 6 a.m. At 8.17 a.m. a train arrives at No. 5 N., bringing a van to go forward to Hull at 10.5 a.m. and another to Newcastle at 10.30 a.m. At 9.18 a.m. a train from King's Cross in No. 6 platform brings a van to go forward on the 9.38 a.m. North express, and two vans for the 10.5 a.m. North train. At 9.20 a.m. a train arrives at No. 4 S. from Sunderland, with restaurant cars detached at York, and a section for King's Cross leaving at 9.28 a.m. At 9.20 a.m. a Great Central train from Sheffield brings a through coach for the 9.38 a.m. Glasgow express. At 9.32 a.m. an express arrives at No. 4 S. from Newcastle, conveying a section for Bournemouth *via* Banbury, leaving at 9.50 a.m., and through vehicles for Bristol (L.M.S.) leaving at 10.10 a.m. At 9.42 a.m. a train from Newcastle to King's Cross passes through on the up main line without calling. At 11.35 a.m. a North train arrives at No. 14, including a Swansea portion, leaving at 11.45 a.m., and through carriages from Newcastle to Bristol for the 12.8 p.m. L.M.S. train to Sheffield. At 1.23 p.m. a parcels train arrives at No. 4 S., including vans for Leeds, Normanton, Doncaster, St. Pancras and York from Newcastle, Middlesbrough, &c. At 1.36 p.m. the down main line is occupied by the 9.50 a.m. from King's Cross for engine-changing purposes. At 1.47 p.m. an express meat train from Tweedmouth to King's Cross passes through on the up main line. A train arriving from Newcastle at No. 14 at 2.8 p.m. includes through vehicles from Newcastle to Scarborough, going forward with a Liverpool-Scarborough vehicle at 2.40 p.m.

At 2.34 p.m. a train from Edinburgh on No. 4 S. includes, on Wednesdays and Saturdays, a through carriage from Newcastle to Hull (Riverside Quay), going forward at 2.47 p.m., together with daily through services from Glasgow to Harwich and from Glasgow to Southampton, going forward at 3 p.m. The last-mentioned train itself arrives from Scarborough at 2.47 on No. 4 N., bringing a through coach for Liverpool. At 3.20 p.m. a train from King's Cross on No. 5 brings three vehicles for Glasgow, transferred to the 3.40 p.m., in combination with through vehicles from Scarborough to Glasgow and Newcastle, arriving at No. 4 N. at 3.23. At 3.24 p.m. a further section for the 3.40 p.m. arrives from Southampton, bringing through vehicles from Southampton and Harwich to Glasgow. The 3.40 p.m. train itself, from No. 14, thus includes a section from Leeds at 3.16 p.m., together with the King's Cross, Southampton and Scarborough sections. The King's Cross portion, it may be pointed out, is the train which was booked non-stop from King's Cross to York, the Scarborough portion going forward at 3.26 p.m. At 4.58 p.m. the down main line is occupied by the 1.15 p.m. from King's Cross, calling to change engines, and at 5.26 p.m. the Leeds-Scarborough non-stop express passes through on the same line. At 5.50 p.m. a train arrives on No. 4 S. from Glasgow, including through vehicles for King's Cross, Scarborough and Penzance. The main train leaves at 5.58 p.m. for Leeds, while the London vehicles are attached in front of the Edinburgh train, arriving at 6.6 and leaving at 6.14 p.m. This latter train also brings Penzance vehicles from Aberdeen, the two sections going forward at 6.25 p.m. for Swindon, on the Great Western line. The Scarborough coach leaves on the 6.18 p.m. train, combined with vehicles from King's Cross due at 6.5 p.m. At 7.5 p.m. an express fish and meat train passes through on the up main line. At 8.15 p.m. a train arrives from King's Cross at 5 S., including restaurant cars which are transferred to the 9.38 p.m. North train. At 9.4 p.m. the 5.30 p.m.

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from King's Cross passes through on the down main line without calling, and at 9.34 p.m. a train arrives at No. 14 from the North, including post office and milk vans for the 10.10 p.m. train to King's Cross and a van to go forward to Manchester at 11.55 p.m. At 9.42 p.m. a Glasgow express arrives at No. 4 S., including a van for Trowbridge, going forward at 10.3 p.m., and a Glasgow–Sheffield through coach. At 11.13 p.m. a train arrives at No. 5 S., bringing through vehicles from Penzance for Glasgow and Aberdeen for transfer to the 11.43 p.m. North express. At 11.15 and 11.25 p.m. through Anglo-Scottish expresses from King's Cross involve the detaching of dining cars run between King's Cross and York. At 12.8 a.m. a parcels train from Newcastle brings vans from Newcastle for York and Leeds, from Sunderland to York, and from Middlesbrough to Leeds, while at 12.17 a.m. a train from Normanton at No. 4 N. brings vans from Liverpool, Manchester and Normanton to Newcastle.

At 1.5 a.m. a mail train from Edinburgh at No. 4 S. involves the detaching and shunting of post office vehicles, the main train leaving at 1.28 a.m. for London. At 2.39 a.m. No. 14 platform is occupied with a through express leaving at 2.54 a.m. for the North. At 2.40 a.m. a train comes into No. 6 from Swindon, bringing vans from Yeovil, Manchester and Leicester to Newcastle, going forward on the 4.15 a.m. parcels train. At 3 a.m. No. 4 S. is occupied by another East Coast express. A train due at 3.4 a.m. from Leeds (No. 5 S.) brings vans for several North and Scarborough line trains. At 3.6 a.m. No. 14 is occupied by another down East Coast express. At 3.13 a.m. a mail train from Sheffield on No. 5 brings vehicles going North at 3.50 a.m., and vans from St. Pancras to Newcastle to go forward on the 4.15 a.m. parcels train. At 3.14 a.m. a further up East Coast express is dealt with on No. 4 S., followed by one from Aberdeen at the same platform, 3.29–39 a.m. At 3.48 a.m. the same platform is occupied by a parcels, horse-box and carriage train, while at 4.40 a.m. No. 4 S. is occupied by a parcels and mails train from King's Cross, including vans going forward on various North trains.

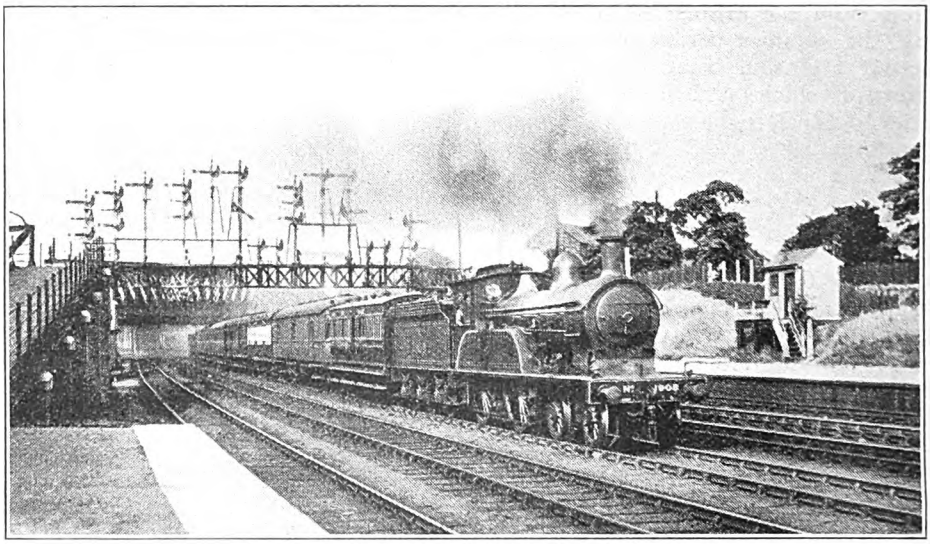

Photo.] [*H. Gordon Tidey.*

LEEDS EXPRESS PASSING HOLGATE BRIDGE PLATFORM.

N.E. 4-4-0 locomotive No. 1908.

These are but a few of the outstanding features of the summer train service arrangements. To them must be added a large number of season excursion trains,

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frequent relief and divisions, and not a few "Saturdays Only" trains in all directions, especially to and from the Scarborough line.

Owing to the magnitude of its traffic York necessarily has a considerable staff, the normal total being nearly 400, while 50 or more porters are added during the summer period. Mr. Wheddon, station master, is assisted by three assistant station masters, nine station inspectors, six station foremen, one yard inspector, 31 ticket collectors, and 220 of other grades. There are 73 traffic regulators, signalmen and signal lads. Attached to the station there are also 46 passenger guards. During the winter these totals are reduced to some extent, but not very greatly, in that the statistics do not include 53 additions for the summer period and 12 further porters on duty on Saturdays and Mondays.

MR. F. WHEDDON.

Stationmaster, York.

Mr. Wheddon, station master, has held that position only since January, 1924, having the unique experience of coming from an entirely distinct section of the London and North Eastern Railway, his previous appointment having been as station master at Leicester, Great Central Section. He commenced his railway career in 1902 with the Great Central Railway, in the District Superintendent's office at Doncaster, where he obtained wide experience in various goods and passenger departments. In 1912 Mr. Wheddon passed a competitive examination in connection with the Great Central Railway higher grade scheme, in consequence of which he spent three years on a special course of study covering all principal departments. At various stations he performed relief duties. During the war Mr. Wheddon served in France and Belgium with the Railway Operating Division, R.E. After demobilisation he returned to the Traffic Department of the Great Central Railway, and in 1919 was appointed assistant station superintendent at the Marylebone terminus. Three years later he was appointed station master at Leicester (Central), at a later stage taking over also control of Great Northern station and passenger work in Leicester. Mr. Wheddon has been associated with many social and staff welfare movements. When at Marylebone he initiated the formation of the Great Central Athletic Association, while he took a leading part in the establishment of the Institute of Transport Metropolitan Graduate and Student Society, of which he is a past Chairman. Mr. Wheddon represented the staff of the Great Central Section on the Board of Trustees of the Railway Convalescent Homes, and takes an active part in the management of the five institutions run by the Homes in different parts of the country.

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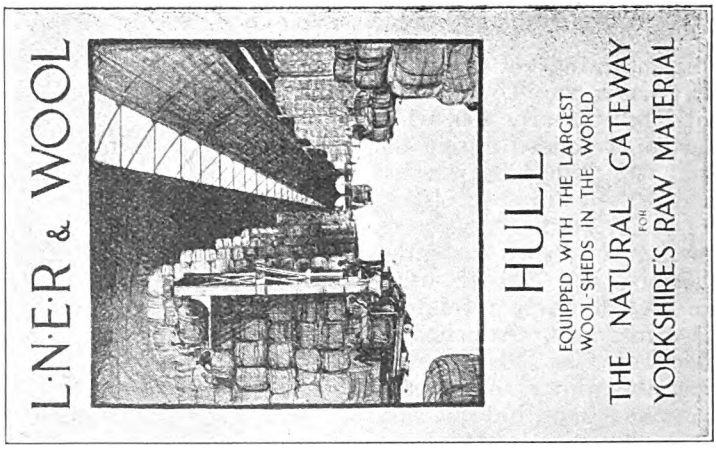
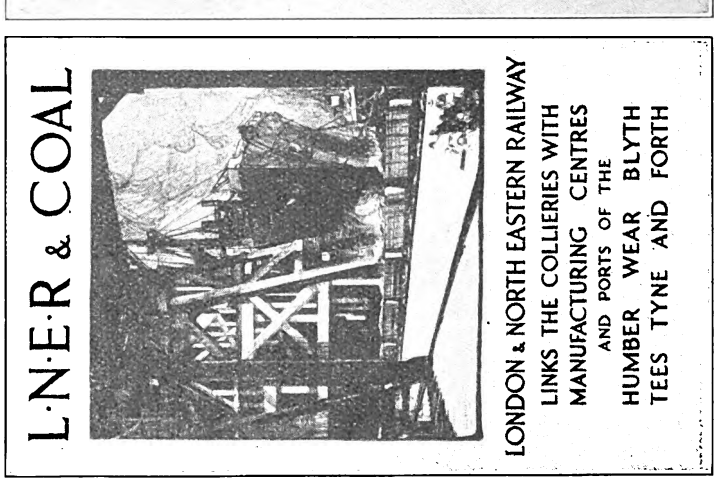
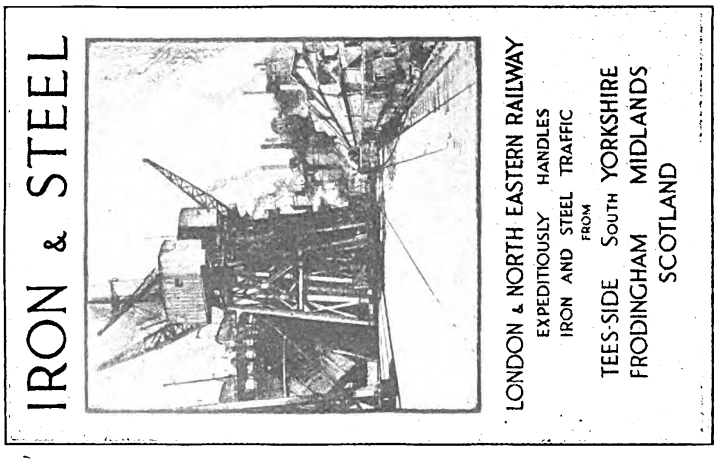
TRADE POSTERS ON THE L.N.E.R.







THREE NOTABLE POSTERS ISSUED TO EMPHASISE L.N.E.R. INDUSTRIAL FACILITIES.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT SOUTHERN AND WESTERN RAILWAY IRELAND. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

LIKE all the main line railways of Ireland, the gauge of this railway is 5 ft. 3 in. Ireland had its own "battle" or rather "skirmish" of the gauges. The Ulster Railway was made with a gauge of 6 ft. 2 in., and the original gauge of the Dublin and Kingstown Railway was 4 ft. 8½ in. When the Dublin and Drogheda Railway was projected, a third gauge, 5 ft. 2 in. wide, was adopted. This happened in 1843, more than two years before the English Gauge Commission sat to decide upon the merits of the question on this side of the Channel. There bid fair to be as many gauges in Ireland as there were counties, but the Ulster and the Dublin and Drogheda Railways, seeing that these two lines would eventually be joined, called in the services of the Board of Trade to adjudicate. The Board of Trade handed the matter over to its chief inspecting officer of railways, a real live major-general R.E., who prepared for the campaign by addressing a circular letter to most of the leading railway engineers of that day, with a view to obtaining their opinions. He omitted Brunel and the two Stephensons on the grounds that they appeared to be already pledged to the 7-ft. and 4-ft. 8½-in. gauges, respectively, though, as an afterthought, he subsequently sent his inquiry to the Stephensons. The other engineers suggested that 5 ft. was the narrowest and 5 ft. 6 in. the widest gauge required, either for the convenience of the machinery of the locomotives or for speed and safety. Having got together this information, the major-general did a small arithmetical calculation, popularly known as "splitting the difference," and recommended a gauge of 5 ft. 3 in., of which nobody in Ireland had hitherto thought. After this, the then President of the Board of Trade, filled with admiration for the major-general's campaign, authorised the 5-ft. 3-in. gauge for all Ireland, and caused the Ulster and the Dublin and Kingstown Railways to fall into line. And this is why the Great Southern and Western Railway, which was incorporated in 1844, did not get the chance of a gauge of its own, but had to use the ready-made fit of the major-general. There are now a good many engineers who wish that the military arithmetic had been similarly applied on this side of the Irish Channel, and that 5 ft. 3 in., instead of 4 ft. 8½ in., had also been made the standard in Great Britain.

Until the year 1901 the G.S. and W.R. was a considerably smaller railway than it then became, when the Waterford, Limerick and Western, and Waterford and Central Ireland, and the Waterford, Dungarvan and Lismore Railways were absorbed. The limits of the present article will be confined to the original railway, and the amalgamated railways mentioned will not be included.

The gradients of the main line from Dublin to Cork (165½ miles) are moderate. There is a steep rise for the first 4 miles out of Kingsbridge station, Dublin, of which about 1¼ miles are at the rate of 1/81 to 1/83. Beyond Newbridge (25 miles) there is a rise of 1/172 for 2½ miles. The first summit is at Kildare, 30 miles from Dublin, the rise being almost continuous throughout. From Kildare there is a 3½-mile fall at 1/180, followed by about 32 miles mostly uphill or undulating, to the 65th post near Ballybrophy, of which the last 2½ miles are at the rate of 1/128 up. Thence almost to the 140th post the line undulates, and from this point to Mallow there is a 4-mile fall of

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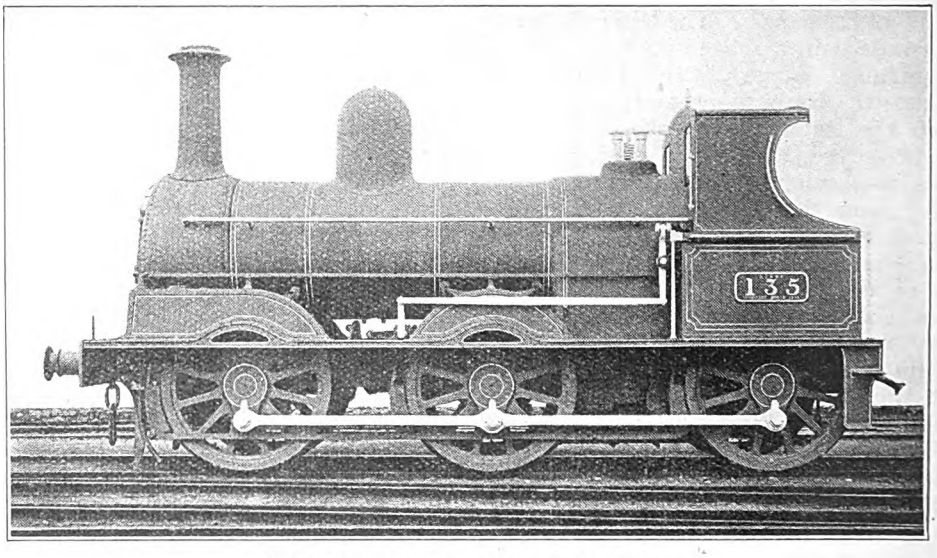
1/151, followed by a 6½-mile ascent, mostly at 1/140. From post 151½ to Cork is downhill, the last 2½ miles being at 1/60 to 1/70. The up trains from Cork were banked to Blarney, to enable them to negotiate the steep ascent through the tunnel, and in some cases a pilot engine ran through to Mallow or Charleville. In the early days all up trains stopped at Inchicore, where the engine was detached, and the train ran down to Kingsbridge by gravity. Down trains from Dublin were banked up to Inchicore.

Perhaps the most interesting feature of the old days was the original permanent way, which was laid throughout in 1846 with ∩-shaped iron bridge rails, weighing no less than 90 lb. per yard, and spiked to cross sleepers. There were no fishplates, but specially wide sleepers were placed beneath the rail joints. The spikes were of a strong hook-shaped pattern. This permanent way was intended to last, and so much faith did the Irishmen place on its lasting qualities that they forgot to repair it properly, a neglect probably also due to lack of money. Between 1870 and 1875 it had become almost the worst permanent way in the kingdom; the iron rails were constantly breaking, and the effect on the engine springs was shattering. Although by 1880 many miles had been relaid with steel rails in chairs, each engine always carried a spare leading spring in case of emergencies. The emergency generally came off, and but few engines returned to Inchicore with the same complete set of springs as that with which it had started, in spite of the fact that the leading springs were made specially strong to resist breakage. As for tyres of the old iron or even the later soft Bessemer steel variety, though they were "there to-day" they were "gone to-morrow." Alexander McDonnell, chief locomotive engineer from 1864 to 1881, replaced the old tyres with very hard crucible steel ones, but the engineer's department was so fond of the old rails that it did not like to part with them, so that even in the late 'seventies it was considered particularly fortunate if an express engine got through from Dublin to Cork and back without breaking a spring.



0-6-0 GOODS LOCOMOTIVE, 1867–1899.

Originally designed by Mr. A. McDonnell, modified by Sir J. Aspinall.

In spite of this the Irishmen were very lucky; their rails broke, their springs did likewise, and the tyres were rolled out, or something else happened, but beyond many delays, no serious accident—that is, from an Irish standpoint—seems to have occurred.

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When the old rails on the main line had broken into a sufficient number of pieces, the latter were used to fill up odd gaps on the branch lines, where lengths of 7, 6 and even 3 ft. were abundant. The passenger had to stand the jolting and survive.

Necessarily the locomotives had to be, and were, a very "game" lot, to rattle over such a road without being shaken to pieces *en route*. Not only did they manage to hold together, but some of the old Sharp's and Bury's engines covered a very big mileage during the course of their existence.

Of the original passenger and express engines, Nos. 1 to 55, fifty-three were of the 2-2-2 type of three different classes. Of these 20 were Sharp's well-known singles, with outside frames, 5-ft. 6-in. wheels, and 15-in. by 20-in. cylinders. Twenty others were by Bury, Curtis and Kennedy; these had inside bar frames, tall, dome-shaped firebox casings, and other Bury features. The diameter of the driving wheels of these was 5 ft. 8 in., and the cylinders were 14 by 20 in. All the above engines, which dated from 1846-48, were gradually taken out of service between 1869 and 1879. Their working pressure was only 80 lb.

The first passenger engine to be built at Inchicore Works was No. 43, and is stated to have appeared in 1853. This had 6-ft. driving wheels and 15 by 20-in. cylinders. But before McDonnell became locomotive superintendent, the main-line fast trains were worked by 12 engines, Nos. 44 to 55, designed by W. Wakefield and built at Inchicore from 1858 to 1863. These had 6-ft. 6-in. single driving wheels, and 15 by 22-in. cylinders. The frames were inside throughout, and the general design had several features in common with McConnell's "Bloomers" on the London and North Western Railway. The brass-covered domes were of Sharp's later 1847 pattern, and, like the latter, were placed near the front of the boiler barrel.

The best train taken by these engines during the 'sixties was the down mail, which left Dublin at 8.35 a.m. and arrived at Cork at 2 p.m., when the permanent way did not put a spoke in the shape of a broken rail into the wheels. The time for stoppages was 27 minutes, so that the running speed was about 33·4 m.p.h., and the overall speed, including stops, was 30½ m.p.h. There was also the day "express," first and second class only, which took 6 hr. 50 min. for the journey. The 7 a.m. train from Dublin, by which passengers of all classes were allowed to travel, required 8 hours. But there were some railways on this side of the Irish Channel whose performances at that time were considerably worse.

The goods engines were mostly of the 0-4-2 type, with inside cylinders and frames, a design to which all Irish railways were very partial on account of the large number of mixed trains, and their moderate loads. Of these there were 10 by Bury, with bar frames, and four very similar engines by Rothwell. The majority, however, were built at Inchicore Works between 1852 and 1865. Some had 4-ft. 6-in. wheels and 15 by 24-in. cylinders, but the later engines had 5-ft. wheels, 16 by 24-in. cylinders, and 120 lb. pressure. There were, before 1866, only eight 0-6-0 engines, all of which were built at Inchicore in 1854–56. The four coupled engines also worked the passenger trains over the Killarney and the longer branch lines.

Rebuilding with new boilers was unknown. In 1867 there were 50 engines from 19 to 21 years' old, and not one of them had had its boiler renewed. Mr. McDonnell, when he arrived upon the scene in 1864, evidently thought that the locomotive stock was a ragged lot. The passenger and most of the goods engines were allowed to wear themselves out, and only a few of the goods engines were reboilered.

There were no tank engines until 1866, when the Great Southern and Western absorbed the Cork and Youghal Railway, which includes the branch to Queenstown. There were 10 locomotives, seven of which were 2-4-0 passenger saddle-tank engines by Neilson & Co., 1859 to 1861. Most of the local suburban passenger traffic of the railway has Cork, and not Dublin, as its centre.

In 1864 Alexander McDonnell became chief locomotive superintendent, a post which he occupied until November, 1881, when he left Inchicore for the North Eastern Railway. His earliest locomotives were 0-6-0 goods engines, the first of which was built at Inchicore in 1866.

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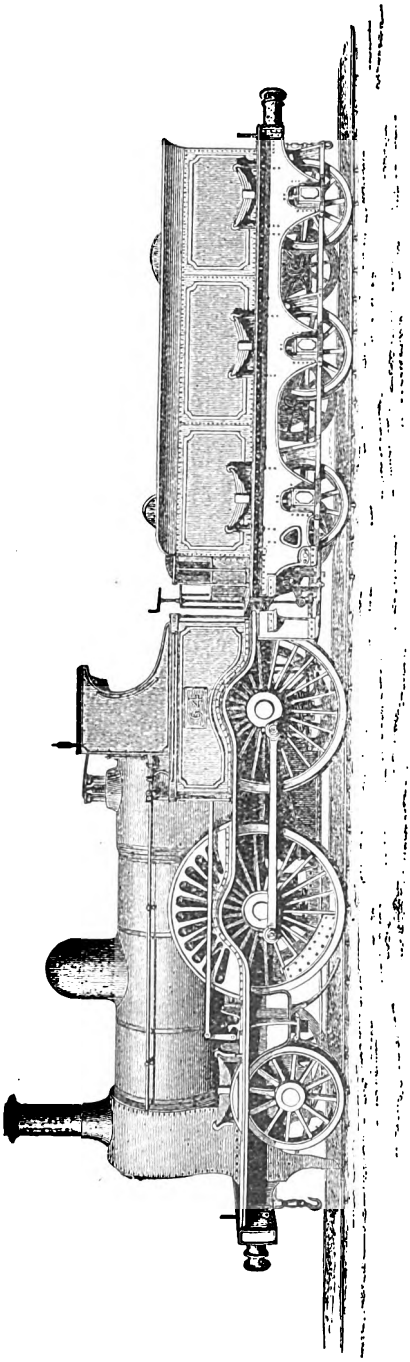

2-4-0 LOCOMOTIVE BUILT AT INCHICORE IN 1875.

Designed by Mr. A. McDonnell. (*From "The Engineer," September* 5, 1879.)

Although the greater number of these were constructed at the company's own works, there were 10 built by Beyer, Peacock & Co. in 1867 and 1873, and six by Sharp, Stewart & Co. in 1872-73. Until the end of 1874, all of this class had 17 by 24-in. cylinders. The coupled wheels were 5 ft. 1¼ in. diam. and were of wrought iron without balance weights. The standard boiler, 4 ft. diam. inside, had a total heating surface of 956½ sq. ft., of which the firebox provided 101½ sq. ft. Pressure, 140 lb. per square inch. Weight in working order of the original engines was about 30¾ tons.

All McDonnell's engines bore a strong resemblance to the old Crewe designs of Ramsbottom, though they were generally much neater in their outlines and details. In certain of the latter they differed from Crewe practice. The fireboxes were raised above the barrels of the boilers, and cast-iron chimneys, either parallel or tapering inwards from bottom to top, were used in the later engines. The smokebox doors were of the double folding pattern, in some respects not unlike the old Midland doors in Matthew Kirtley's time, but were flush with the smokebox front, and not projecting as on the Midland. The valve rods were suspended from swing links in place of the more usual method of employing valve-spindle guides. The coupling rods had cast-iron bushes lined with white metal.

In 1875 the diameter of the cylinders of the goods engines was increased to 18 in., and since that date all the old 17-in. cylinders have been replaced by the larger ones. About 1882 cast-iron wheels of the Webb pattern, with I-spokes, were introduced, and all goods engines built during the superintendency of Mr. (now Sir John) Aspinall were provided with wheels of this type. The pressure was increased at this time to 160 lb., as steel boilers were introduced.

It is a testimony to the excellence of the original design that, with the modification mentioned, it remained the standard until 1899, when the last of the type with raised firebox casing was built at Inchicore. There were 99 of the class, Nos. 101 to 199. It may be added that 12 similar engines, with larger boilers and flush-topped firebox casings, were subsequently built at Inchicore in 1902-1903.

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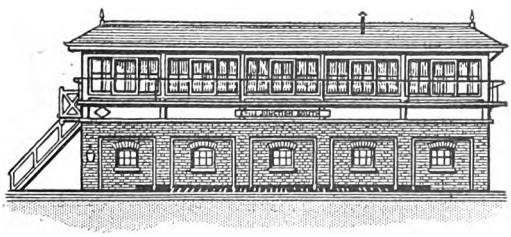
McDonnell's first six express engines appeared early in 1869, and replaced the single engines on the mail and express trains. The new engines, Nos. 56 to 61, were of the 2-4-0 type with inside bearings throughout, and in outward appearance were almost replicas of Ramsbottom's 2-4-0 engines on the L. and N.W.R. The cylinders were 16 in. by 22 in.; the diameter of the coupled wheels was 6 ft. 6 in., and of the leading wheels, 4 ft. Wheel base, 14 ft. 9 in., the coupled axles being 7 ft. 9 in. centre to centre. Total heating surface, 993 sq. ft., of which the firebox contributed 95½ sq. ft. Weight in working order, 32 tons 7 cwt. Two almost similar engines, Nos. 62 and 63, built in 1870, had coupled wheels 6 ft. 1 in. in diameter.

In 1875 two more 2-4-0 express engines, Nos. 64 and 65, were built specially for the mail trains, and in nearly all respects were like the 56 class with 6-ft. 6-in. wheels, but had larger cylinders 17 in. by 22 in., though the total heating surface was reduced to 931 sq. ft. These were the last express engines built until 1883. All the above were constructed at Inchicore, and all were scrapped before the end of the nineteenth century.

In 1875 the running speed of the mail trains had been increased to 38 miles per hour. The express engines ran through from Dublin to Cork and returned the following day, pilot engines standing at Thurles and Limerick Junction in readiness for emergencies. The average load of the mail trains was eight six-wheeled coaches, the mean weight of which was 76 tons. The maximum load over the whole journey was 11½ coaches, or about 110 tons, though 13 and 14 coaches were occasionally taken over part of the road. The "expresses," which averaged 30 m.p.h., were somewhat heavier, the maximum summer loads being 14½ coaches through to Cork, though the average throughout the year did not exceed nine coaches. On a few occasions 16 to 21 coaches were taken over part of the road, though in this case a pilot engine was probably used.

A class of light passenger engine, the No. 1 class, also of the 2-4-0 type, dated from 1869, and was used for main line local trains, and to some extent on the long Killarney and Athlone branches. These were considerably smaller than the main line express engines, and had coupled wheels 5 ft. 7½ in. diameter only. The cylinders of those built before 1873 were 15 in. by 20 in., but ten later engines of 1873–76, Nos. 21 to 26 and 66 to 69, had 16-in. by 20-in. cylinders, the wheels being increased to 5 ft. 8 in. by using thicker tyres. Total wheel base, 13 ft. 11 in. Total heating surface of the later engines, 859 sq. ft. Total weight in working order, 27 tons 2½ cwt. A few of the later engines were still at work recently.

(To be continued.)



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CHRISTMAS DAY IN NEW ZEALAND.

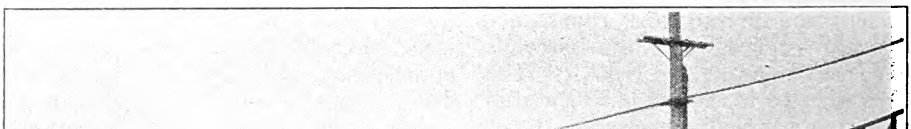

Photo.] [*C. J. Housego.*

NEW ZEALAND GOVERNMENT RAILWAYS.

Auckland and Wellington "Limited" Express passing Newmarket Junction.
4-6-2 locomotive No. 704, Class AB.

We are indebted to Mr. C. J. Housego, of Newmarket, Auckland, New Zealand, for the print reproduced, taken on Christmas Day, 1924. The photograph shows a train introduced in December last. It is a "Limited" express, reducing the time between Auckland and Wellington by about 3½ hours. As Mr. Housego explains, the ordinary express still runs, but 30 minutes later, and calls at the original stations as formerly, and is also run to the old timing of 17½ hours for the 426 miles, but this train consists of anything from 12 to 20 coaches according to the patronage offering just prior to departure at either terminal. "I have even seen the latter figure exceeded on occasions, notably at holiday times when excursion fares prevail, and in addition to this factor there are several hundred immigrants who need transporting by rail to their destinations down the line."

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1825-1925.

IV.—DEVELOPMENT OF WORLD'S RAILWAYS.

(*Continued from page* 219, *March Number.*)

IN nearly all the South American Republics there are State-owned railways and a fair percentage of State-worked lines, but by far the greater proportion is in the hands of private railway companies, who have constructed lines under concessions of various kinds, or have taken over State lines for working. The situation is, in fact, exceptionally complex, so many factors having influenced development in each individual case, while there has been a great deal of transfer from the State to company, company to State, or company to company, so that no generic principle can be said to have governed the growth of the South American system, while each State has its own special features of control and policy in regard to railway enterprise. North American financial activities are also represented, and there are important French and Belgian interests; but much the larger proportion of the total railway mileage is in the hands of British enterprise, either as constructing and working or as working companies. Each Republic maintains, however, a strong hold upon railway working, particularly in Argentina and Brazil.

Of all the South American States the Argentine Republic is best provided with railway facilities, there being quite a number of large and important systems principally owned and financed by British companies. The four largest are the great broad-gauge lines—the Buenos Ayres Great Southern, Buenos Ayres Western, Buenos Ayres and Pacific, and Central Argentine. The first railway in the Argentine Republic was a line connecting Buenos Ayres with Flores, opened in August, 1857. This is now included in the Buenos Ayres Western system, a company formed in 1890 to take over a number of then existing lines, including the Once-Morena section, which incorporated the original line. This section, by the way, is now operated electrically. The Buenos Ayres Great Southern Railway includes another early line, that between Buenos Ayres and Chascomus, opened for traffic in December, 1865. The Central Argentine Railway includes a section from the Retiro station in Buenos Ayres to Victoria, opened for traffic in 1863.

Speaking generally, however, while many other lines were built in the 'sixties and particularly in the 'seventies, principal development occurred during the 'eighties and 'nineties. Thus, the Argentine Great Western Railway was formed in 1887 to take over a Government line running from Villa Mercedes, on the Buenos Ayres and Pacific Railway, to Mendoza, to join the Argentine Transandine Railway, with an extension north to San Juan. The Argentine North Eastern Railway, formed in 1887, took over two existing lines—from Monte Caseros to Corrientes and to Posadas. The Bahia Blanca and North Western Railway was formed in 1889 for constructing lines from Bahia Blanca to Villa Mercedes.

Besides being the largest of the Argentine railways, the Argentine Great Southern Railway took over or worked several earlier lines, including the Buenos Ayres, Ensenada and South Coast, and Buenos Ayres Midland Railways, also being concerned with other companies in several further lines. The Buenos Ayres and Pacific Railway Company dated from 1882, its earliest lines being those from Mercedes to Chacabuco (1885), Alvear (1886), and to Villa Mercedes (1886); also from Buenos Ayres to Mercedes (1888). The portion of the Andine Railway from Villa Mercedes to Rio Cuarto was purchased in 1909.

The Buenos Ayres Western Railway was formed in 1890, taking over 660 miles of railway belonging to the Buenos Ayres Provincial Government. The Central Argentine Railway incorporates the Buenos Ayres and Rosario, originally constituted in 1873 as the Buenos Ayres and Campana Railway. Other principal railways are the Cordoba Central, dating from 1887, and the Entre Rios, formed in 1891. The Argentine Transandine Railway began as

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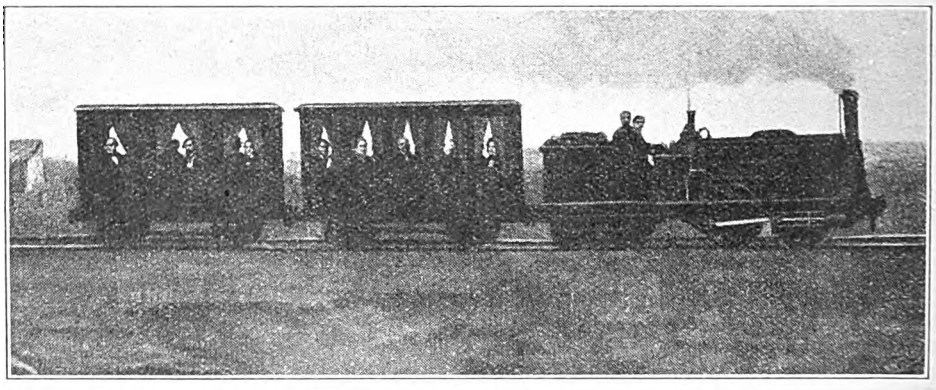
the Buenos Ayres and Valparaiso Transandine Railway, the company dating from 1886, though it was not until 1891 that the first section was opened. The line was finally completed and opened throughout in 1910 to the Chilian frontier, whence it is continued as the Chilian Transandine Railway. This line provides the only trans-South American one from the Argentine, though another route is well advanced. The steepest sections are worked on the rack principle, and at the summit there is a tunnel 3,165 metres in length, of which 1,782 metres are on the Argentine side.

With regard to other lines, the Buenos Ayres, Ensenada and South Coast Railway includes sections opened as early as 1888, though the Buenos Ayres Midland was not brought into use for traffic until 1910, and the principal sections of the Central Railway of Chubut, although the company was originally registered in 1886, were not completed until the present century. It is of interest to note that the original concession for the Villa Maria and Rufino Railway dates fron 1866, though the line was not opened until 1891.

In Brazil part of the Great Western system was opened in 1881-82, between Recife and Nazareth. The Leopoldina is, however, the largest British-owned system in Brazil, and includes a number of smaller lines, some constructed at comparatively early dates. One, in fact, was the first railway in Brazil, and one of the earliest in South America. This is the section from Maua, at the end of the Bay of Rio, to the foot of the Petropolis Serra. It was opened in 1854, on the 5-ft. 6-in. gauge, but was subsequently altered to metre gauge. It includes a rack section extending for nearly four miles. Another early line is included in the San Paulo system. This was built to the 5-ft. 3-in. gauge and opened from Santo *via* San Paulo to Jundiahy in 1867. Part of this line is worked by cable haulage, and ranks as one of the most remarkable in the world. In 1895 the line was doubled, and a series of five new inclines constructed. The system includes also the Bragantina Railway, part of which was opened in 1884.

In Chili the section of the Antofagasta (Chili) and Bolivia Railway from Antofagasta to Pampa Alta commenced as a nitrate-carrying line on the 2-ft. 6-in. gauge. The 90 miles from Antofagasta to Pampa Alta were constructed 1877-83. Ollague was reached in 1887, and Uyuni in 1889. Previously in the hands of the Huanchaca Mining Company, the railway was sold to the present company in 1889, but continued to be worked by the Huanchaca Company until taken over by the owners in 1903. The waterworks supply the town of Antofagasta with water, and include about 500 miles of aqueduct construction. Beyond Uyani the gauge is metre. There is also a third metre-gauge rail from Antofagasta to Baquedano, the junction with the Chilian Northern Longitudinal Railway. Oruro was reached in 1892. The system is continued as the Bolivia Railway to Viacha, from where the Antofagasta Company's own line completes the route to La Paz. The Bolivia



AN ORIGINAL TRAIN IN ARGENTINA.

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Railway was leased to the Antofagasta Company as from January 1, 1909, who also undertook the construction of uncompleted Bolivian lines and to convert the Uyuni–Oruro section to metre gauge. The Oruro–Cochabamba, Rio Mulato–Potosi, and Uyuni–Atocha branches have been constructed mostly at 12,000-16,000 ft. above sea level, the highest point being reached on the branch to Potosi, 15,816 ft.

One of the earliest lines in Chili was the Arica and Tacna, which dates fron 1857. Another was the Carrizal and Cerro Blanco, partially opened in 1864 and extended in 1868. A part of the Chilian Transandine Railway was opened in 1889, though it was not until March, 1910, that the Argentine frontier was reached and connection made with the Argentine Transandine Railway. Eight sections of the line are operated by means of rack locomotives. The Nitrate and Taltal Railways include sections opened as early as 1882. Part of the Dorada Extension Railway in Colombia dates back to 1884. In Paraguay, sections of the Paraguay Central system were opened as early as 1859, though principal extensions occurred in the 'eighties and 'nineties. In Peru there is an extensive system of railways now operated under the Peruvian Corporation, taking over lines originally belonging to the Peruvian State system in 1890.

The Oroya or Central Railway was begun in 1870, and in 1876 ninety miles, terminating at an altitude of over 13,000 ft., had been constructed. This line later pierces the mountains at the Galera tunnel, the highest standard gauge railway in the world, 15,665 ft. above sea level, a height exceeded only in the world by the Antofagasta and Bolivia Railway, as above mentioned. This line was taken over by the Peruvian Corporation, 1891, and completed to Oroya in 1893. Extensions have been made to Huancayo and Ayacucho, and will eventually join the Southern Railway at Cuzco. Galera tunnel is 4,000 ft. long. The Southern Railway runs from Mollendo to Juliaca, and thence to Cuzco and Lake Titicaca. It was opened from Mollendo to Crucero Alto, 1884. Between Arequipa and Lake Titicaca a height of 15,000 ft. is reached. The Guaqui–La Paz Railway in Bolivia is worked as part of the Peruvian Southern system.

In Uruguay, also, there are numerous associated railways. One group, worked in conjunction with the Central Uruguay Railway, includes lines from Montevideo to Santa Lucia, opened in 1872, and to Durazno in 1874. The Midland of Uruguay group covers mainly railways opened from 1889 onwards. The North Western Railway of Uruguay includes a section opened in 1878, the line being opened throughout in 1887.

There is a wide variety of gauges throughout South America, as also in Central America, and in all parts where the usual broad gauge standard is 5 ft. 6 in., as in the Argentine Republic, or 4 ft. 8½ in., as in certain other states, there are numerous metre or narrow-gauge lines.

In Central America the system operated by the United Railways of the Havana includes one of the very earliest lines on the American Continent. This was the first railway in Cuba, opened July 28, 1837, Havana to Bejucal, subsequently extended to Guines (32 miles); the Compania de Caminhas de Hierro de la Habana (1842), Ferro Carril de Alfonso XII (1886), Cardenas and Jucaro Railway, Cardenas Railway (1839), Jucaro Railway (1841), Cardenas to Pizarro Railway (1859), Matanzas Railway (1841), and Marianao and Havana Railway (1858) leased together with other lines previously belonging to the Bank of Commerce and associated warehouse and railway enterprises, several sections dating back to the 'forties and 'fifties, besides those mentioned. The Western Railway of Havana division was partially built by a Cuban company formed in 1857, but the original scheme was not completed until 1894. The line now extends from Havana to Guane. The Cuban Central division combines the Cienfuegos, Sagua and Caibarien Railways, all constructed prior to 1850, together with lines built since amalgamation in 1899.

In Mexico two early lines may be mentioned, including portions of the Mexican Railway from Mexico to Puebla, opened in 1869, and to Vera Cruz, 1873. Portions of the Interoceanic Railway date back to the 'nineties, but principal developments have occurred during later years. Beside British-owned railways in South and Central America there are numerous State systems or lines owned by local or

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American-financed companies. In the main, however, the earlier stages have to be credited to British enterprise.

In Canada, the Grand Trunk Railway, the "Pioneer Railway of Canada," was chartered 1852, and amalgamated various small lines, including the St. Lawrence and Champlain, the first railway in Canada, and the Quebec and Richmond, St. Lawrence and Atlantic, Old Grand Trunk, Grand Junction, Toronto, Guelph and Sarnia, and Main Trunk Railways. The route from Riviere du Loup, P.Q., to Sarnia was completed in 1858. The Victoria Bridge at Montreal ($1\frac{3}{4}$ miles in length with approaches) was completed 1860, and formally opened for traffic by the late King Edward VII as Prince of Wales. Among the railways amalgamated with or leased or worked by the Grand Trunk Railway were the Great Western of Canada (amalgamated 1882), Northern of Canada, International Bridge (opened November 3, 1873), St. Clair Tunnel, Victoria Jubilee Bridge (completed December, 1898), Grand Trunk Pacific, and other lines. Originally the gauge of many sections was 5 ft. 6 in., but in 1870 these were converted to the usual standard. In 1879 the Government purchased the Point Levi (opposite Quebec)–Riviere du Loup section for the Intercolonial (Government) Railway. Connection across the St. Clair River was maintained by car ferry-boats until the tunnel between Sarnia and Fort Huron was opened in 1891. The Chicago and Grand Trunk Railway was completed 1881, and renamed Grand Trunk Western Railway in 1900. The combined system included a considerable mileage in the United States, and provided through services not only between the chief towns in Canada, but also between these and the principal centres in the United States. Associated was the Grand Trunk Pacific Railway, built in conjunction with the Dominion Government, and which provided a through route from Moncton, N.B., to Prince Rupert, wholly within Canadian territory. The first Niagara bridge, between Fort Erie and Buffalo, was completed 1873 and completely rebuilt 1890.

COMPLETING THE CANADIAN PACIFIC RAILWAY.

Lord Strathcona driving the last spike, November 7, 1885.

The Canadian Northern Railway, incorporated 1900, and including the Lake Manitoba and Canal Company, taken over in 1896, was constructed to supply a third trans-Continental railway, and extends from Halifax, N.S., to Vancouver. In 1896 the derelict charter of the Lake Manitoba Railway was acquired, and a line from Lake Winnipeg to Lake Superior

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begun. In 1902 the Manitoba lines of the Northern Pacific were leased. Port Arthur, on Lake Superior, was reached 1902, Edmonton 1905, Prince Albert 1906, Regina 1907. The Canadian Northern Pacific Railway in British Columbia and the Canadian Northern Western Railway in Alberta are included in the system. In November, 1917, the Government of the Dominion acquired the whole of the common stock of the Canadian Northern system, thus becoming sole owners. The Inter-Colonial, Trans-Continental and Prince Edward Island Railways, known as the Canadian Government Railway, incorporated by Special Act of the Dominion of Canada for the operation of railways under Federal control by the Canadian National Railway Company on behalf of the Government. As first set up, it included the Canadian Northern and Canadian Government (Inter-Colonial, Prince Edward Island and National Trans-Continental lines) Railways. The Grand Trunk Pacific Railway was added February, 1920. The Grand Trunk Railway of Canada was actually taken over at the same time, but outstanding problems affecting terms, &c., deferred the actual incorporation until 1923.

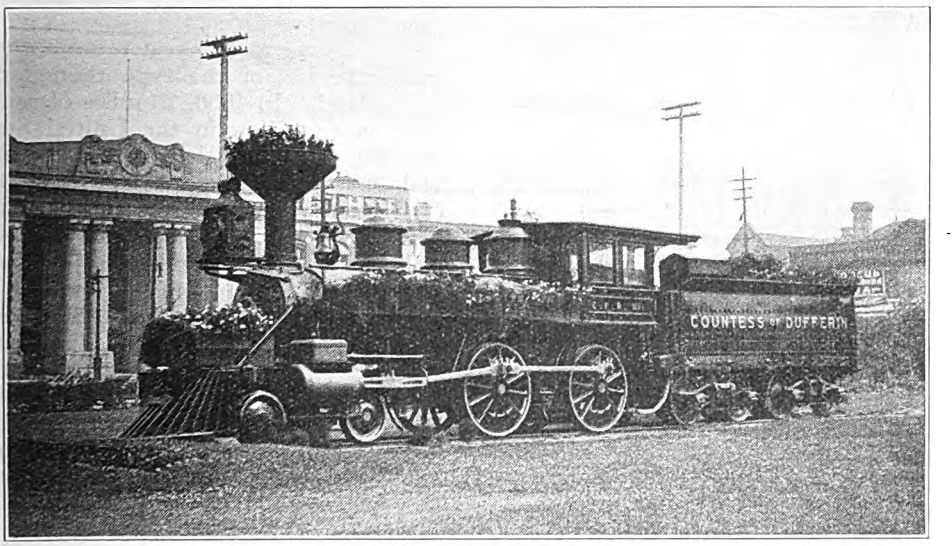

Photo.] C.P.R. ENGINE "COUNTESS OF DUFFERIN." [*R. C. Carter.*

Outside C.P.R. Depot, Winnipeg.

were combined with the Canadian Northern Railway, and included in the Canadian National Railways.

The Grand Trunk Pacific Railway, incorporated 1903, was built by the Grand Trunk Railway in co-operation with the Dominion Government to provide a through route from Moncton, N.B., to Prince Rupert, B.C., wholly within Canadian territory. The Western Division, Winnipeg to Prince Rupert, included the Prairie and Mountain sections. The Eastern Division extended from Winnipeg to Moncton, N.B. In February, 1920, the system was taken over by the Government.

The Canadian National Railways were

The Canadian Pacific Railway, taking over 713 miles built by the Government, was formed in 1881, receiving also $25,000,000, a loan of $29,000,000 (since repaid), and a grant of 25,000,000 acres of land, with certain prior rights against competitive railway construction (relinquished in exchange for a Government guarantee of an issue of $15,000,000 of fifty-year 3½ per cent. bonds), for the construction of a trans-Continental route across Canada. Construction was begun in 1881, and completed throughout May 26, 1887, from Montreal to Vancouver. Certain United States lines are also controlled by the company, including the Minneapolis,

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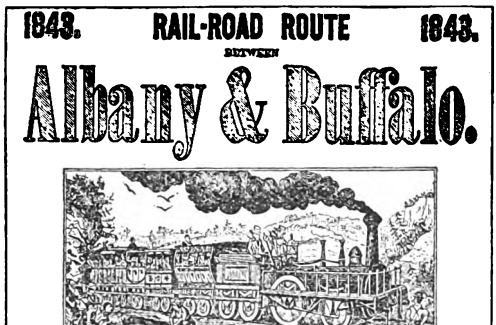


1843. RAIL-ROAD ROUTE 1843.

BETWEEN

Albany & Buffalo.

FARE REDUCED--ARRANGEMENT TO COMMENCE JULY 10 1843.

Those who pay *through* between Albany and Buffalo, - $10. in the best cars.
do. do. do. 8. in accomodation cars,
which have been re-arranged, cushioned and lighted.
Those who pay *through* between Albany & Rochester, $8. in the best cars.
do. do. do. 6.50 in accomodation cars.

THREE DAILY LINES.

Through in 25 hours.

GOING WEST.

		1st Train.	2d Train.	3d Train.
Leave	Albany.	6 A. M.	1 P. M.	7 P. M.
Pass	Schenectady,	7 A. M.	2 P. M.	8 P. M.
Pass	Utica.	1 P. M.	9 P. M.	4 A. M.
Pass	Syracuse.	3 P. M.	2 A. M.	6 A. M.
Pass	Auburn.	7 P. M.	4 A. M.	10 A. M.
Pass	Rochester,	9 A. M.	10 A. M.	4 P. M.
Arrive at	Buffalo.	7 A. M.	3 P. M.	9 P. M.

GOING EAST.

		1st Train.	2d Train.	3d Train.
Leave	Buffalo.	4 A. M.	9 A. M.	4 P. M.
Pass	Rochester,	6 A. M.	3 P. M.	10 P. M.
Pass	Auburn.	3 P. M.	8 P. M.	4 A. M.
Pass	Syracuse.	5 P. M.	11 P. M.	6 A. M.
Pass	Utica.	8 P. M.	4 A. M.	10 A. M.
Pass	Schenectady,	3 A. M.	10 A. M.	3 P. M.
Arrive at	Albany,	8 A. M.	11 A. M.	4 P. M.

EMIGRANTS WILL BE CARRIED ONLY BY SPECIAL CONTRACT.

Passengers will procure tickets at the offices at Albany, Buffalo or Rochester *through*, to be entitled to seats at the reduced rates.

Fare will be received at each of the above places to any other places named on the route.

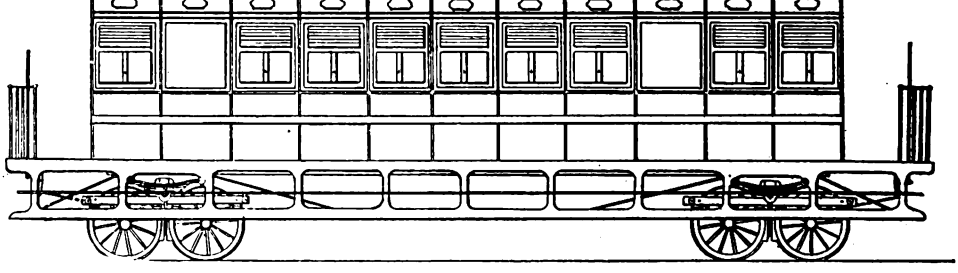
AN AMERICAN RAILWAY POSTER OF 1843.

St. Paul and Sault Ste. Marie, and the Duluth, South Shore and Atlantic Railways. Associated steamer services have been developed to a notable degree, and are operated by the Canadian Pacific Steamship services in regard to trans-Atlantic and trans-Pacific services, and similar organisations for the Great Lakes coast and river services. The company also owns vast mining and lumbering industries.

Besides the great systems there are several smaller and more or less independent railways in Canada, but there is no need to consider them in detail.

Although pioneer honours in regard to railways belong to this country, the United States were early in the field, and it is interesting to note that, even before the year 1830, most of the States had granted railway charters, and by that date several of the lines were in course of construction. The South Carolina Railroad was commenced in 1827, and in the same year the Delaware and Hudson Canal Company built a short line for the conveyance of coal. It was upon this line that the first locomotive run on the American continent was employed. This was imported from England and named the *Stourbridge Lion*. It was of the type then current in England. In 1830, 23 miles of railway were in operation in the United States. In 1831 the relatively lengthy Baltimore and Ohio line was added, and in 1833 the Charleston and Hamburg line in South Carolina, with 135 miles in operation, claimed to be the then longest railway in the world.

Other early railways were the Bangor and Piscataqua; Boston and Providence; Boston and Worcester; Boston and Lowell; Eastern; Andover and Haverhill; Taunton Branch; New York, Providence and Boston; Utica and Schenectady; Saratoga and Schenectady; Long Island; New York and Harlem; Buffalo and Niagara Falls; Lockport and Niagara Falls; Tonawanda; Camden and Amboy; Camden and Woodbury; Morris and Essex; New Jersey, Paterson and Hudson; Philadelphia and Reading; Philadelphia and Trenton; Philadelphia and Wilmington; Philadelphia and Columbia; Harrisburg,



EARLY EIGHT-WHEELED PASSENGER CARRIAGE, BALTIMORE AND OHIO RAILWAY, U.S.A.

(*From "Railway and Locomotive Engineering."*)

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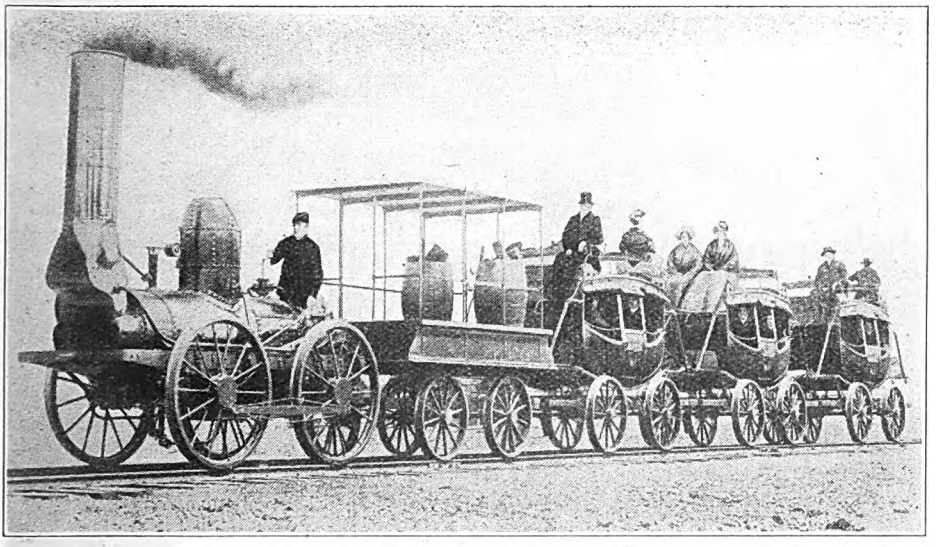

"DE WITT CLINTON" AND TRAIN (1831).

Portsmouth, Mount Joy and Lancaster; Cumberland Valley; Danville and Pottsville; Williamsport and Elmira; Hazelton Coal Company, Beaver Meadow; Allegheny Portage; Newcastle and French town Turnpike and Railroad; Philadelphia, Wilmington and Baltimore; Baltimore and Ohio; Baltimore and Susquehanna; Portsmouth and Roanoke; Greenville and Roanoke; Raleigh and Gaston; City Point; Richmond and Petersburg; Richmond, Fredericksburg and Potomac; Wilmington and Raleigh; South Carolina Canal and Railroad; Central Railroad and Banking Company of Georgia, St. Joseph and Lake Wimmico, Mobile and Cedar Point; Pontchartrain; Carrolton; Nashville and New Orleans; Lexington and Ohio; Mad River and Lake Erie; Erie and Kalamazoo; and Central Railroad of the State of Michigan.

All of these date back to the 'thirties, and quite a number of them employed engines purchased in England, though among the locomotives can be traced many of the original Baldwin locomotives and engines constructed by others of the locomotive building firms of that day. It would require far more space than can be given to review even in outline the development of United States railways, but among the most exciting stories extant is that of the making of the first trans-Continental railway in the States, for a distance of 1,770 miles between Omaha and Sacramento, across prairie and through mountain, and much of it through quite unknown country. There was, in fact, a race as to which of the two companies concerned could make most, for grants of land went with the completed mileage. Eventually, the Central Pacific, with the aid of "Crocker's Pets," 11,000 Chinamen, and Jack Casement's 10,000 Irishmen for the Union Pacific, met at Promontory Point, near Ogden, thus completing the task, and the "Last Spike" was driven, with appropriate ceremonies, on Sunday, May 9, 1869.

Besides the standard railways, with which may be associated other fairly old lines, such as the steam-operated elevated railways of New York and Chicago, there are several rack railways, of which the Pike's Peak line in Colorado is one of the most interesting. There are also railways such as the Florida East Coast, which connects the mainland with Key West by means of many miles of viaduct constructed from islet to islet. Some of the railways which cross the Rockies and other great mountain ranges, too, have involved arduous feats of construction, and in many places one may be inclined to wonder how a railway could be carried through at all.

Except for the selection of illustrations appended, this part of our review must be

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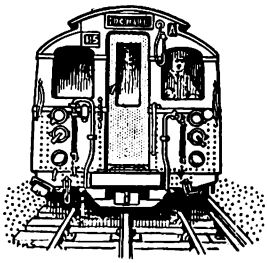
THE FIRST AMERICAN TRANS-CONTINENTAL RAILWAY.
Connecting the Union and Central Pacific Railways at Promontory, Utah, May 10, 1869.

allowed to stand as it is, though it is necessary to emphasise once again that although thus dismissed briefly, when one speaks of the railways of the United States one is considering approximately one-third of the total railway mileage of the world and about ten times the length of track in the British Isles. But as already indicated, a good part of this consists of single track lines over which relatively few, though frequently very heavy, trains are operated, in contrast with the majority of our own railways.

So far as various smaller States in the world are concerned, it may be mentioned that, in Demerara, the railway from Georgetown to Mahaica was incorporated as far back as 1846, though it was not, apparently, opened until some time later, and principal extensions date from 1900. In Mauritius there are lines originally opened in 1864-65, while in Trinidad the first railway dates back to 1876.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

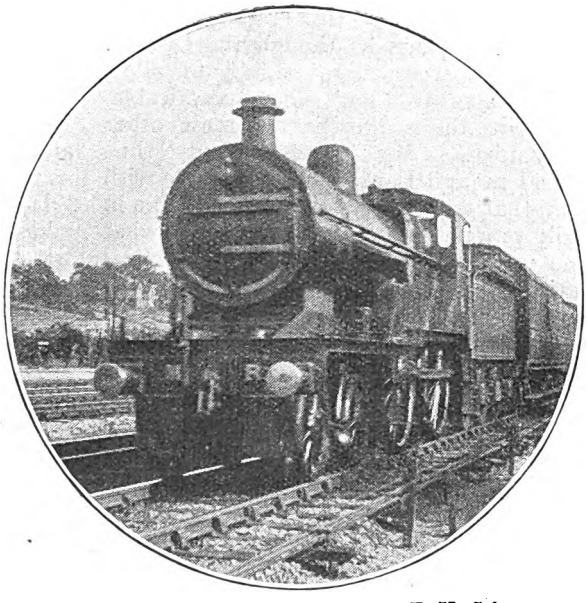

Photo.] [*F. H. Stingemore.*

DOWN BEDFORD TRAIN NEAR RADLETT.

Rebuilt M.R. 4-4-0 locomotive No. 555.

FROM a reader at Newcastle-on-Tyne I have received recently some correspondence which bears in so interesting a fashion on my subject-matter of the past few articles that I desire to lose no time in making the contents of his letters public. "Some time ago," he writes, "it occurred to me that the effects of gradients on speed might be tested for the purpose of comparing the difficulties of our main-line routes, by calculating the schedule obtainable with a "standard" train and engine, for which the resistance and tractive effort might be calculated from published data. I have started to do this with a train assumed at 500 tons gross weight behind the engine tender, and an engine and tender of 120 tons weight. The gradients are those which have been published from time to time in the RAILWAY MAGAZINE. From the graphs of resistance and tractive effort it is, of course, possible to go over any given route, accelerate the speed from the start, and follow its changes over the gradients, so as to obtain a complete graph of speed for the journey. Even if the assumptions made as to engine-working are not strictly in accordance with practice (which itself differs with individual drivers, engines, and lines), they appear to give results as to speed sufficiently close to what is actually met with in practice to justify the method for purposes of comparison, because they are applied equally in the compared cases."

"I have begun by working out two down runs from London, one by Great Western Railway from Paddington to Exeter, and one over the Great Northern main line from King's Cross to Doncaster. The schedules I have calculated make no allowances for any influences other than those of gradients, and such service slacks as are known. Thus, no allowance is made for cautious running, owing to curves or the train being in advance of schedule, nor for any extra resistance imposed by curves, taking water from troughs, &c. Such allowances would have to be added to the time in comparing the work over various routes. Comparing my schedule with your run behind *Pendennis Castle* recorded in the issue for last December, my heavy train is slower in ascent from Taunton to Whiteball than yours, which by then was considerably lighter; but in other respects it seems that either my phantom engine is less powerful than the 'Castle' class, or else that train resistance on the G.W.R. is less than that given by formula. In any

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event, it appears as though the G.W.R. authorities were more willing to allow their trains to 'go,' when practicable, than are the authorities of most other companies." My correspondent thus considers (and I am inclined to agree with him) that the G.W.R. engines seem able in daily practice to do work well above what one would expect from their theoretical rating.

"On the Great Northern," the letter continues, "the trains of similar weight do not attain to the schedule that I have calculated. I have myself timed, with stop-watch, several 'Pullman' runs to Leeds, and find these give passing times which closely agree with those of my calculated schedule at almost every point as far as Newark, when there must be some cause unknown to me to account for the slowing of the trains beyond which occurs in actual practice." This is readily explained by the fact that Great Northern schedules—like those of many of their neighbours—are, in general, unduly liberal over the easier sections of their main line, and if a driver has kept time as far as Grantham on the Harrogate Pullman, he can and does take things very easily from there on to Doncaster. The best work over this stretch is done by trains starting from Grantham; on such expresses as the 5.30 p.m. out of King's Cross, for example, "even time" from Grantham to Retford and Doncaster is no unusual occurrence, as may be seen later in the present article. "It is interesting to note," the writer adds, "the severe handicap imposed by the rise from King's Cross at the start, and by the subsequent ascent from Wood Green to Potters Bar, before high speed can be attained; so that 'even time' to Peterborough is more difficult of achievement than 'even time' to Savernake, in spite of the fact that Savernake is high above Paddington, whereas Peterborough is on the level with, or lower than, King's Cross."

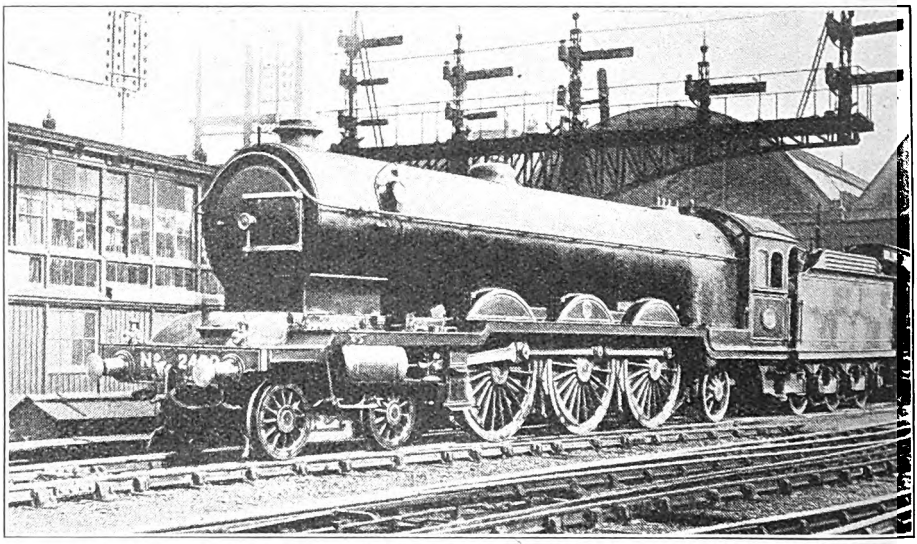

Photo.] [*W. J. Kohning.*

5.45 P.M. DOWN EXPRESS READY TO LEAVE KING'S CROSS.

N.E. 4-6-2 locomotive No. 2400.

I have promised my correspondent not to divulge his complete schedules, but may say that the times at which he has arrived, by calculation, are, roughly: 25 min. to Hatfield, 39 to Hitchin, 61¼ to Huntingdon, 78¼ to Peterborough, 107 to Stoke, 112 to Grantham, 124¼ to Newark, 141¾ to Retford, and 158 to the Doncaster stop, by Great Northern; 21 min. to Slough, 38 to Reading, 57¾ to Newbury, 76¾ to Savernake, 98½ to Westbury, 121¼ to Castle Cary, 142½ to Cogload, 148 to

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Taunton, 163¼ to Whiteball Summit, and 182 to Exeter stop, by Great Western Railway. It will be seen that the actual times booked by the Great Western authorities, in the case of the down "Riviera" and other three-hour trains to Exeter, are 1 min. superior to these times to Westbury, and 2 min. to Taunton and Exeter, but owing to slipped vehicles the actual trains are usually well under the 500 tons beyond Westbury. The Great Northern calculated times, on the other hand, are considerably faster than most of the booked times on that section of the L.N.E.R., which lends point to my correspondent's contention that the traffic authorities of the latter do not, as yet, permit their modern locomotives to do all that they might in the way of speed.

My friend adds: "It would be interesting to have a Sunday test of a Great Western 'Castle,' and 500-ton train from King's Cross to York, driving the engine 'all out,' save for the due observance of speed restrictions." And, further, "I should also like to see the G.W.R. pull a 350-ton train up Hemerdon bank, and then to see a Great Northern 'Pacific' do the same." Personally, I believe both types would succeed with the latter task, without much difficulty, given a dry rail. As regards the former suggestion, nothing could, of course, be more interesting. The "all out" mentioned, of course, gives the clue to my correspondent's general method of calculation, and explains, in particular, the very high downhill speeds at which he arrives over both routes. This was, indeed, a difficulty to me for a time, in comparing my average running figures—on really fast runs—with his, until I realised, with full recollection of my recent footplate experience on the Great Western Railway, that after the good uphill work which so often characterises present-day running, it is the custom, more often than not, to work engines under the easiest steam downhill, in order to avoid running too much in front of time.

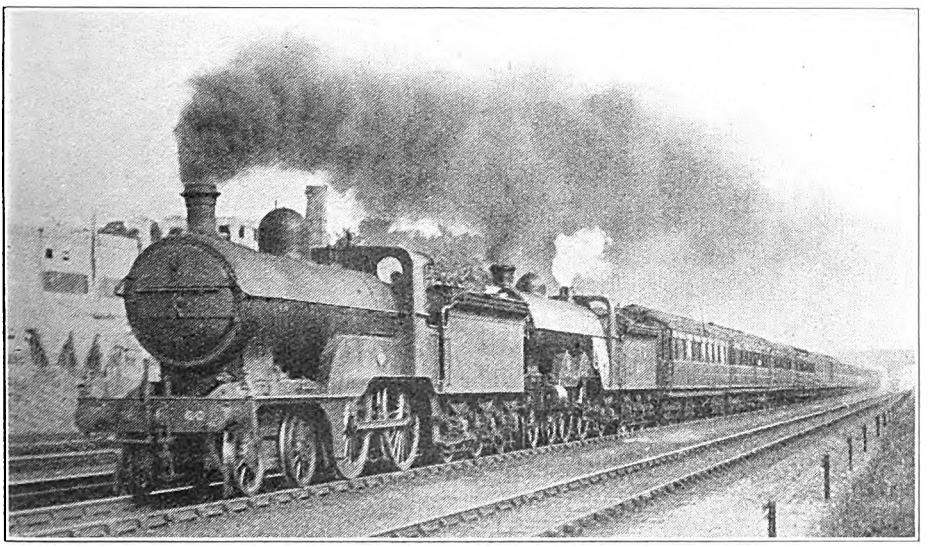

Photo.] **5.30 P.M. DOWN NEWCASTLE EXPRESS.** [*F. E. Mackay.*

G.N. 4-4-0 locomotive No. 60 and 4-4-2 locomotive No. 1441.

Before coming to this realisation, I wrote my correspondent on this point, and received the self-explanatory reply that follows: "I am not yet prepared to agree with your suggestion that I have under-estimated wind or engine resistance at the higher speeds; nor do I think I have over-estimated the tractive force available by my engine at those speeds; and my warrant for saying so is the various actual performances pub-

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lished by you or recorded by myself. My engine is not that of a particular company, but works impartially on all lines. It is assumed to work without being 'held in,' on account of getting ahead of schedule times; and it is not subject to side-winds, greasy rails, changes of train resistance, and so on. To bring in these differences would defeat the object of the investigation, which is to test the effect of gradients alone. It would therefore be necessary, in order to support your contention, to show that my downhill speeds were too fast in *both* the calculated schedules that I sent you."

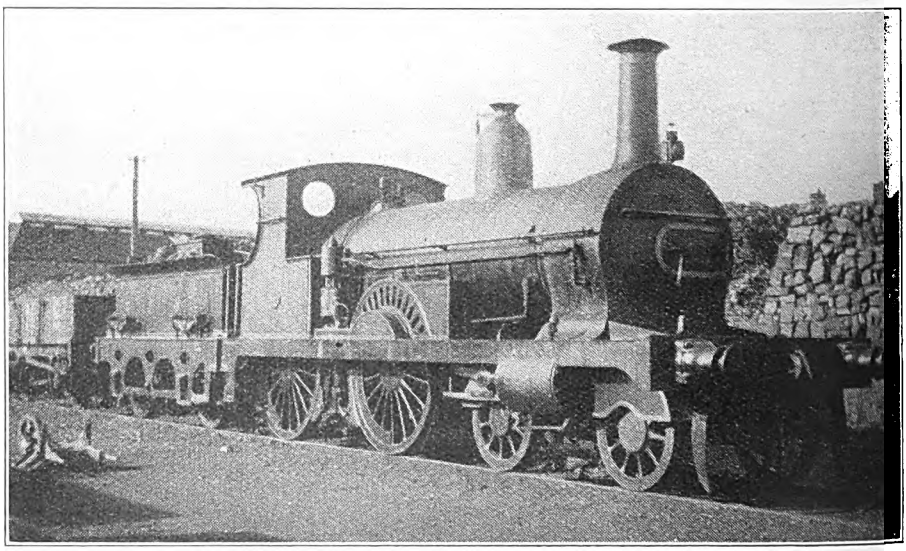

Photo.] [*R. D. Stephen.*

OLD GREAT NORTH OF SCOTLAND 4-4-0 LOCOMOTIVE No. 45A AT KITTYBREWSTER.

"As I said in my previous letter, Great Northern engines are seldom let out to show what they really can do, so that their performance is often below the possible. Your high speeds north of Hitchin"—the reference is to my article of last month—"are, of course, excellent, but I was once fortunate in getting an extraordinary run on the 1.15 p.m. 'Scotsman' from King's Cross, in which I recorded even faster times than yours. I think that this performance, which is the best I have ever recorded during many years' experience of the East Coast route, shows what engines of the G.N. 'Atlantic' type can do, when in good condition, by way of high sustained speed on down grades. There may have been an inspector on the footplate, and it may have been an object to test what could be done by way of attaining 'even time' at Peterborough. It is worth noting, too, that the engine was not changed at Grantham, and quick acceleration and high speed again were indulged in from Grantham start to Markham Box. But from Peterborough to Grantham and Markham on to York the running was very easy, to avoid getting too far ahead of time. In any case, there were here, fortunately, circumstances which allowed the engine to show its paces with a train of fairly heavy service weight."

"Talking of resistances brings me to speak of the great discrepancy which appears to exist between the values given by published formulæ and those met with in actual practice; at least, under favourable conditions. You state that *Pendennis Castle* got up to 69 m.p.h. east of Reading, with 530 tons behind the tender. According to information published in regard to the tests of *Caldicot Castle*, the drawbar pull at 69 miles an hour should hardly exceed 2·5 tons, and this means a resistance of only 10·55 lb. per ton on the 530-ton train. Such a

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resistance is amazingly below that given by any of the usual published formulæ, which give resistances between 16 lb. and 19 lb. per ton at that speed. Is it not a fact that some lines employ coaches of higher resistance per ton than others?" I think this is undoubtedly the case; and it is even more the case in regard to differences in locomotive design. The wind resistance set up by the bow-ended type of vestibuled coach in use on the London and North Eastern line, for example, should be less than of a coach with square ends, and in any event vestibuled stock, by reason of its gangways, should set up less wind resistance in eddy currents between the coaches than non-vestibuled cars.

Electrically lighted coaches, on the other hand, will offer more frictional resistance to motion than those lighted by gas, by reason of the dynamos driven from the axles, and if electricity be used for cooking also, as mentioned last month, the resistance should be further increased. But the trouble in regard to resistance formulæ in general, I think, is that they have not kept pace with the improvements effected in modern locomotives and rolling-stock. Strictly speaking, every type of engine and every coach will have its own resistance figure. As regards engines, again, the beautifully light nickel-chrome steel connecting rods and coupling rods, and the two sets of Walschaert's valve-motion of the Gresley "Pacifics," should offer less resistance at speed than, say, the heavier rods and the three sets of Stephenson's link motion on the Raven "Pacifics" of the same railway. My friend suggests another important factor in train resistance, and that arising out of the dragging of air over the ballast under the train by its passage, which would vary with different types of ballast and of coach construction.

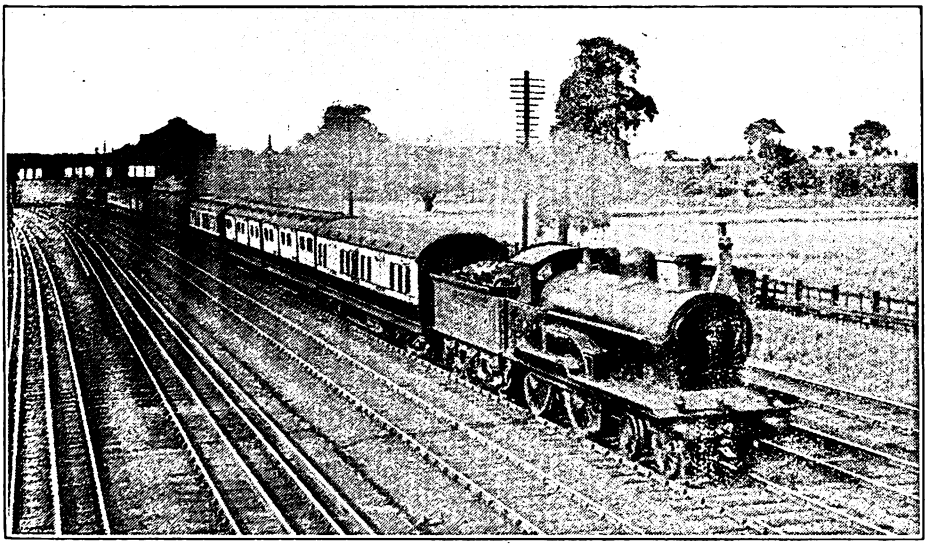

Photo.] UP CARLISLE EXPRESS, L.M.S.R. [*F. E. Mackay.*

L.N.W. "George the Fifth" type 4-4-0 engine No. 5365, "Racehorse."

"There is one more point on which I would like to offer a comment," my correspondent's letter concludes. "In ascending a gradient, the excess weight of, say, the recent G.W. *Great Bear*, would be about 25 tons as compared with a 'Castle' of equal tractive force. In, climbing Hemerdon bank, for example, the former would have to move a train whose gross weight would exceed that of the latter's train by the equivalent of nearly an extra bogie corridor coach; or, alternatively, the train-load would have to be reduced in the former case, assuming the two types were regarded as of equal tractive capacity. It is possible that, in

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such a comparison, the smaller and lighter engine might prove economically more powerful than the huge machines which might, in their turn, be their superiors on long moderately level routes." On grades of exceptional severity, such as Hemerdon, this is doubtless possible, as the capacity of the engine to climb would be limited—on a bank, say, two or three miles long—by adhesion weight rather than ability to produce steam, and in this respect a 4-6-0 and a 4-6-2 would be on an equal footing. But the extra weight of the 4-6-2, with the development of boiler and fire-box that is permitted by this wheel arrangement, should be more than compensated for on long runs by the additional capacity to produce steam without excessive coal consumption.

The run on the 1.15 p.m. down, to which my correspondent referred in his letter, was as follows:—

Miles.		Min.	sec.
0·0	King's Cross	0	00
2·5	Finsbury Park	6	45
5·0	Wood Green	10	00
12·7	Potters Bar	20	28
17·7	Hatfield	25	25
28·6	Stevenage	36	27
31·9	Hitchin	39	20
37·0	Arlesey	43	06
44·1	Sandy	48	35
51·7	St. Neot's	54	43
58·9	Huntingdon	60	51
69·4	Holme	70	52
75·0	Fletton Junction	76	00
76·4	Peterborough	78	05
	(Engine eased)		
105·5	Grantham	119	55
0·0		0	00
4·2	Barkstone	5	41
9·9	Claypole	10	32
14·6	Newark	14	30
20·9	Carlton	19	48
26·4	Tuxford	25	20
28·2	Markham Box	27	28
33·1	Retford	32	35
	(Engine eased)		
50·5	Doncaster (pass)	52	35

The engine was "Atlantic" No. 294 throughout, and the load eleven bogies, prior to the introduction of the new Scotch stock, which would mean a load of fully 375 tons. The extraordinary features are, of course, the speed from Stevenage onwards—the time of 21 min. 31 sec. from Hitchin to Huntingdon beats my own record between these points by 9 sec.—and the start from Grantham, which as far as Newark was amazing. Out of Grantham No. 294 must have been driven "all out," with a vengeance. From notes which my correspondent supplies as to his method of timing, there can be no doubt as to the accuracy of the extraordinary time of 5 min. 41 sec. from Grantham start to Barkstone. From Hitchin to Arlesey speed averaged 81·2 m.p.h.; from Stevenage to Huntingdon (30·3 miles), 74·4 m.p.h.; from Potters Bar to Fletton Junction (62·3 miles), 67·3 m.p.h., and then from Barkstone to Carlton, 71·1 m.p.h.—a notable effort indeed.

As regards the northern part of the journey, "even time" from Grantham to Doncaster, or something closely approaching it, is, as I have said, a common enough occurrence. The first table gives skeleton times of nine of my own down journeys, six with "Atlantics" and three with Raven "Pacifics" of the N.E. type (all my G.N. "Pacific" runs have been so desperately punctual from Grantham that nothing speedy has been attempted). All the runs except the fifth were on the 5.30 p.m. from King's Cross, allowed 54 min. from Grantham to Doncaster, and then, curiously enough, as much as 42 min. on to York. Over the level stretch from Doncaster to York, complicated only by the severe Selby check, drivers are somewhat at a loss to know how to fill in their time, with the schedule demanding an average speed of only 46 m.p.h.

No. 1414 touched 74 m.p.h. twice before Newark, passed Carlton at 70½, breasted Markham Summit at 49, and passed Retford at 72½ m.p.h., doing nothing of note afterwards, and yet gaining 6¼ min. to York. No. 4417 made a brilliant start, reaching 75 m.p.h. at Hougham, and maintaining 72½ to 77½ from there to Newark; Carlton was passed at 67, Crow Park at 66, Markham at 53, and Retford at 74, after which the engine was eased; "even time" was attained at Scrooby. No. 4401, which has given me a number of excellent runs, touched 79 m.p.h. between Claypole and Newark, passed Carlton at 71½ and Crow Park at 68, afterwards breasting Markham at 50½ m.p.h. and taking Retford at 71½; at Bawtry we were inside "even time," but once again this was the end of serious effort. On the next trip No. 4401 did some even faster running, the actual time

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to Doncaster being the best of the series; speeds were 74 m.p.h. at Hougham, and between that figure and 77½ from there to Newark, 70½ at Carlton, 53 at Markham, 74 before Retford, which the driver eased to 64 through the station, 67 to 70½ from Sutton to Scrooby troughs, 51 at Piper's Wood and 66 before Doncaster, followed once more by the usual "slump."

Then come the two very similar piloted runs. That in column 5 was on the down morning "Scotsman," and although nothing of particular note was done, we had a clear road throughout, and ran into York at 1.35 p.m., 7 min. early; by contrast, any time that was gained on the 3.30 p.m. trips was mostly in recovery of late starts from Grantham. On the 10 a.m. trip we nowhere exceeded 71½ m.p.h., and fell to 44 at Markham and 53 at Piper's Wood summits, showing how extremely liberal are some of these timings. The other piloted "Atlantic" trip was on the 5.30 p.m. again, on a Bank Holiday evening; we touched 74 m.p.h. before Newark, 71½ at Retford, 69 at Scrooby and 68 below Rossington, falling intermediately to 49½ at Markham and 55½ at Piper's Wood.

Then come the three North Eastern "Pacific" runs, timed during last summer, when the N.E. section was working this train through from Grantham to Newcastle. The summer formation being a coach less than the winter, the big engines had even more difficulty in filling out their allowances. No. 2403, *City of Durham*, on her first trip, reached 75 m.p.h. at Claypole, and varied between 79 and 71½ from there to Newark; after that the engine was eased, and except for touching 70½ at Scrooby, there was nothing more of note to York. Darlington was reached in 143 min. from Grant-

TABLE 1.—L.N.E.R.: GRANTHAM–YORK.

	Engine Type	G.N. 4-4-2.				G.N. 4-4-2.*		N.E. 4-6-2.		
	Engine No.	1414	4417	4401	4401	4401	296	2403	2403	2400
	Load (axles)	42	42	42	42	‡47	58	38	38	40
	,, (tons tare) ..	303	303	306	306	391	436	263	264	275
	,, (tons full) ..	320	320	325	325	420	475	280	280	290
Miles.		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	Grantham	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
4·2	Barkstone	7 30	7 05	7 00	7 10	6 30	7 00	6 40	6 55	7 35
9·9	Claypole	12 30	11 50	11 45	12 00	11 25	11 50	11 20	11 55	12 35
14·6	Newark	16 30	15 45	15 40	15 55	15 40	16 05	15 10	16 05	16 40
20·9	Carlton	22 00	21 15	21 05	21 15	21 50	22 00	20 45	22 00	22 25
28·2	Markham Box	29 50	28 55	28 45	28 40	30 20	30 05	29 15	29 55	30 15
									p.w.r.	
33·1	Retford	34 40	33 35	33 40	33 20	35 15	34 55	34 10	35 20	34 45
42·2	Bawtry	43 05	42 25	42 00	41 40	44 10	43 20	42 20	46 30	42 00
		p.w.r.			sigs.					sigs.
45·8	Rossington	47 30	46 35	45 50	45 35	48 00	47 00	46 00	50 20	45 50
								sigs.	sigs.	sigs.
50·5	Doncaster	52 15	51 10	50 30	50 20	52 25	51 20	51 15	56 00	53 30
			sig.				p.w.r.			
			stop.							
54·7	Shaftholme Junction ..	56 30	60 40	55 05	55 00	56 40	56 40	56 20	60 50	59 40
					sig.		p.w.r.			
					stop.					
68·9	Selby	71 45	77 30	70 25	72 35	71 05	73 40	72 10	74 20	72 55
			sigs.	eased	sigs.		sig.	sigs.	sigs.	sigs.
							stop			
82·7	York	89 45	97 30	91 35	94 55	90 10	95 00	†95 25	†93 20	†93 00
50·5	Net time (min.) to Doncaster (pass.)	51½	51¼	50½	52¼	52½	51¼	50½	51½	50¼

* Piloted by non-superheated 4-4-0. † Passing time (at walking pace). ‡ New Scotch stock.

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ham, or 136 min. net. On the next trip the start was very moderate, and the Retford check was almost a dead stand; the only noteworthy feature was good running from Shaftholme to Templehirst, the 9·6 miles being covered in 8¾ min., with a top speed of 71½ m.p.h. There was some fairly good running beyond York, Darlington being reached in 141 min. 25 sec., or 133½ min. net.

Lastly, No. 2400, *City of Newcastle*, after making an indifferent start, awoke to some display of energy at Markham, touching 77½ m.p.h. at Retford, and averaging 75·3 an hour from there to Bawtry, with a maximum of 79 at Scrooby troughs—quite my record over this length of line. After three very severe signal checks, we also did fairly well beyond Doncaster, with maxima of 66 at both Balne and Templehirst, but further signal delays supervened beyond Selby. Good running was then made between York and Darlington, with a top speed of 68 an hour at Thirsk, and we reached Darlington in 138¾ min., or 132 min. net. The schedule was 141 min., and presumably included the slack to walking pace necessary at York to set down the G.N. pilotman. It is rather difficult to understand the precise object of this engine working, separate North Eastern crews were required for the southbound and northbound journeys of the engine respectively with G.N. pilotmen in addition between York or Selby and Grantham, and the very severe York slack, going north, to set them down; while the engine itself stood idle at Grantham from 11.30 a.m. to 7.30 p.m.

The tables of runs between York and Darlington are really designed to show what the "Pacific" engines can do in the way of speed on a level track, but only the south-bound table is of any value in that direction, most of the north-bound efforts being mediocre to a degree. All due allowance must be made for the fact that North Eastern crews have had to accustom themselves to the handling of a locomotive type differing radically in many respects from their own standards—and especially the firing of a wide firebox instead of the long narrow type in vogue on North Eastern engines generally—but even so the work I have recorded with the "Pacifics" north of York, with rare exceptions, falls short of that so frequently put up south of Doncaster. This is partly because there seems a general

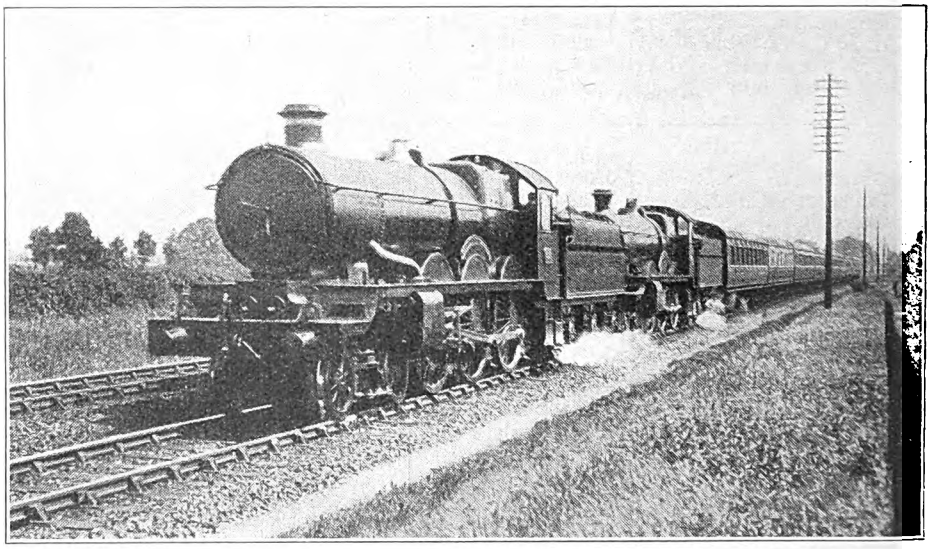

Photo.] [*J. F. Dearden.*

DOWN BRISTOL TWO-HOUR EXPRESS, G.W.R., NEAR STEVENTON.

Engines No. 4073 "Pendennis Castle" and No. 4018 "Knight of the Grand Cross."

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sire on the part of G.N. drivers regain arrears of time when opportunity offers; and also because loads d schedules south of Doncaster generally mand more of the engines than is the se farther north.

The brightest efforts in the second ble were thus those of the "Atlantics." os. 1, 3, 4 and 5 were timed by correondents and the remainder by myself. n the 9.38 a.m. down No. 2201 did artly, with a light train of 225 tons, allowed to Darlington (in place of the old 45 min.), got up to 66 m.p.h. at Alne, 70½ at Thirsk, and 71½ at both Danby and Croft, with intervening minima of 65 at Northallerton and 65 at Eryholme. The best part of No. 2171's effort was the start, which was considerably faster than generally obtains in these days; subsequently the best speeds were 69 an hour at Pilmoor, and at Danby, and 70 at Croft, the minima being 62 at Northallerton and 66 at Eryholme. No. 2172

TABLE 2.—L.N.E.R.: YORK–DARLINGTON.

	Engine Type	N.E. 4-4-2.					N.E. 4-6-2.			G.N. 4-6-2.
	Engine No.	‡2201	‡2208	2171	‡2172	§699	2402	2404	2402	2570
	Load (axles)	30	33	34	34	46	42	42	42	42
	,, (tons tare) ..	214	219	222	235	324	296	296	303	300
	,, (tons full) ..	225	235	235	250	340	315	325	325	320
Miles.		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	York	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
1·6	Poppleton Junction ..	3 35	4 20	3 30	3 55	3 50	4 35	3 45	4 25	4 10
5·5	Beningbrough	7 50	9 00	7 50	8 30	8 15	9 50	8 15	9 35	9 10
9·7	Tollerton..	11 45	13 10	11 50	12 40	12 10	14 10	12 25	14 00	13 45
1·2	Alne	13 00	14 35	13 10	14 05	13 30	15 35	13 50	15 30	15 15
3·4	Raskelf	14 55	16 35	15 05	16 05	15 25	17 35	15 50	17 40	17 35
6·1	Pilmoor	17 25	19 10	17 32	18 35	17 50	20 10	18 30	20 20	20 30
8·0	Sessay	19 05	20 55	19 15	20 20	19 30	21 55	20 20	22 15	22 35
22·2	Thirsk	22 45	24 45	23 10	24 10	23 15	25 45	24 15	26 05	26 55
26·6	Otterington	26 45	28 35	27 15	28 00	27 15	29 40	28 20	29 55	31 20
30·0	Northallerton	30 15	31 45	30 35	31 15	30 25	32 50	31 45	33 10	34 50
33·7	Danby	33 45	35 10	34 02	34 35	34 00	36 15	35 20	36 40	38 20
37·2	Cowton	36 55	38 10	37 05	37 50	37 20 p.w.r.	39 20	38 45	39 55	41 25
38·9	Eryholme	38 40	39 45	38 45	39 30	39 35	40 55	40 30	41 40	43 05
41·5	Croft Spa	41 00	42 10	40 55	41 50 sigs.	42 30	43 10 sigs.	43 00 sigs.	44 10	45 20
44·1	Darlington	*43 22	45 40	44 30	45 55	47 00	47 35	47 05	47 50	48 50
44·1	Net times (min.) ..	†44½	45¾	44½	45½	44¾	46¾	46½	47¾	48¾

* Passing time. † To stop (equivalent). ‡ Three-cylinder, Class Z. § Two-cylinder, Class V.

peed reaching 69 m.p.h. at Alne and 72 t Thirsk, after which the engine was ased, and fell to 56½ at Northallerton; ubsequent speeds were 64 at Danby, 2 at Eryholme, and 69 at Croft. Ferryill, 57 miles, was passed in 56 min. 0 sec., Durham (at 20 m.p.h.), 66·1 miles, n 66 min. 55 sec., and the old 82-min. chedule of this train was clearly realisble, but the driver, being early, eased lown, and took 86 min. to Newcastle, nstead of the present remarkably liberal igure of 92 min. No. 2208, with 47 min. maintained an even rate of 64 to 67 m.p.h. from Alne to Northallerton, touched 69 at Danby and 72 at Croft, and fell to 62 at Eryholme.

By far the best down journey was made by the two-cylinder "V" No. 699—to my knowledge a very good engine, as is also 698—and very unaccountably, too, as the train was the 1.15 p.m. from King's Cross, allowed 51 min. The start was quite electrifying, with such a road, and speeds of 69 m.p.h. at Alne and 70 at Thirsk followed; "even time" had

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been bettered at Cowton, but the very bad p.w.r. check at Dalton bank spoiled the finish of the run. Then come the four "Pacific" trips, all rather dreary, in view of the proved capacity of the engines, especially as there were late starts to every run but that of No. 2402 in the eighth column. In run No. 6 the same engine started wretchedly, but got up to 70½ m.p.h. at Thirsk, and again at Danby, falling to 66 at both Northallerton and Eryholme, and then touched 74 at Croft, nearly 2 min. to Northallerton; afte that we touched 68 an hour at Danb and 74 at Croft, with an intervenin minimum of 64 at Eryholme, so ju contriving to keep time.

Fortunately, most of the up runs we considerably more enterprising. The fir two, timed by a Newcastle friend, we both "Atlantic" efforts on the 43-mi Glasgow to Leeds flier. No. 1753—a engine of the first "V" batch—display an unexpected turn for speed, reachi

TABLE 3.—L.N.E.R.: DARLINGTON-YORK.

	Engine Type	N.E. 4-4-2.		N.E. 4-6-2.				G.N. 4-6-2.		
	Engine No.	*1753	†2199	2402	2404	2403	2404	2569	2568	257
	Load (axles)	38	38	34	46	‡40	60	42	‡40	‡4
	,, (tons tare) ..	264	265	234	332	343	415	291	343	37
	,, (tons full) ..	280	280	245	350	365	445	305	360	40
Miles.		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m.
0·0	Darlington	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 0
2·6	Croft Spa	4 52	4 23	4 33	5 00	5 05	5 15	5 00	5 25	5 0
5·2	Eryholme	7 38	6 57	7 12	7 55	7 55	8 15	7 55	8 25	7 4
6·9	Cowton	9 14	8 35	8 51	9 40	9 40	10 10	9 40	10 15	9 2
10·4	Danby Wiske	12 19	11 34	11 47	13 00	12 40	13 30	12 55	13 25	12 2
14·1	Northallerton	15 39	14 46	15 11 sigs.	16 40	16 00	17 10	16 25	16 55	16 0
17·5	Otterington	18 44	17 40	18 51	19 50	19 00	20 25	19 35	20 05	19 0
21·9	Thirsk	22 27	21 16	22 33	23 50	22 45	24 25	23 20	23 45	22 4
26·1	Sessay	26 02	24 56	26 04	27 45	26 40	28 30	27 05	27 25	26 2
28·0	Pilmoor	27 42	26 36	27 37	29 35	28 25	30 20	28 50	29 10	28 1
30·7	Raskelf	30 00	28 51	29 47	32 15	30 55	32 55	31 10	31 30	30 4
32·9	Alne	31 45	30 39	31 28	34 10	33 00	34 45	33 00	33 20	32 3
34·4	Tollerton..	32 57	31 50	32 37	35 35	34 25	36 10	34 20	34 40	34 0
38·6	Beningbrough	36 40 sigs.	35 19	35 55	39 25	38 30	40 10	38 05	38 25	38 3
42·5	Poppleton Junction ..	41 20 sigs.	38 35	39 03 sigs.	43 10 sigs.	42 25 sigs.	43 55 sigs.	41 40 sigs.	41 55 sigs.	43 0 sig
44·1	York	45 00	41 35	42 15	46 10	46 05	47 25	45 15	46 00	46 2
44·1	Net times (min.) ..	43	41½	40¾	46¼	45½	47	44¾	45	46½

* Two-cylinder, Class V. † Three-cylinder, Class Z. ‡ New Scotch stock.

the time of 29 min. for the 31·8 miles from Tollerton to Croft being very fair. No. 2404 ran at 66-67 m.p.h. from Tollerton to Thirsk, fell to 62½ at Northallerton, and finished easily after touching 68 at Danby. On 2402's second trip, the slow start was again in evidence, but 70½ an hour was reached at Thirsk, and the minimum at Northallerton was 65; after that we touched 68 at Danby and Croft, and fell to 59 at Eryholme. The run with No. 2570 was a miserable exhibition, after a late start of 11 min., the engine dropping 72 m.p.h. at Danby, 74 at Thirsk, and again at Alne, and would have kept tim but for concluding signal delays. I ha a very similar run with the same engi and load; the start was excellent, th engine accelerating from 57½ m.p.h. Croft up 1 in 356 to 60 at Eryholm passing these two points in 4 min. 35 se and 7 min. 15 sec. respectively; b Northallerton the two runs were lev again, and continued exactly so to Sessa after which my run fell behind to the e tent of 20 sec. at Beningbrough, and w

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finished in 43 min. 20 sec.; maxima were 69 an hour at Danby, 74 at Thirsk and 72½ at Alne. No. 2199 made an exceptionally fast start, getting up to 62 m.p.h. at Croft and accelerating uphill to 63 at Eryholme; after that speeds were 74 an hour at Danby, 70 at Northallerton, 75 at Thirsk, 70 at Pilmoor, 75 at Raskelf, 71½ beyond Tollerton, and an unusual acceleration to 75 again at Skelton Bridge, time being improved on by 1½ min.

Next follows the "Pacific" effort in the third column. This train is now worked by Gateshead shed with "Pacific" engines nightly, and I was greatly interested to see how one would shape. Fortunately, an enterprising driver was on the footplate of No. 2402, in the person of Turner, and despite a signal check from over 70 down to 45 m.p.h., in the middle of the run, and signals on from Poppleton into York, he succeeded in cutting the schedule by ¾-min. His net time was not more than 40¾ min. But, most interesting of all, he showed the "Pacific" to be no whit behind the "Z" class "Atlantics" in speed by attaining 80·3 m.p.h. on the level section of the run between Raskelf and Alne, and, indeed, by maintaining 79 for a considerable distance on the level. We were doing 59 at Croft, and immediately after 60, and maintained that rate up to Eryholme, beyond which we touched 74 before Danby, but eased down to 69 for taking water at Wiske Moor. After passing Northallerton at 69, and just crossing the "70" line, we experienced the signal check at Hutton Wood, but, accelerating rapidly thereafter, we were doing 65 at Otterington, 74 at Thirsk, and still continued a gradual acceleration to 75 just beyond. At Pilmoor we were running at 76½ an hour, at Raskelf at 79, and at Alne we had reached the "80" level, after which we kept up 79 for some distance past Tollerton, and maintained 76½ from Beningbrough to shutting off steam before Poppleton. We were thus running at over 75 m.p.h., practically on the level, for about 20 miles continuously, and our average speed over the 20·6 miles from Thirsk to Poppleton Junction was almost precisely 75 m.p.h., which includes the preliminary easing for York. This was a very entertaining trip.

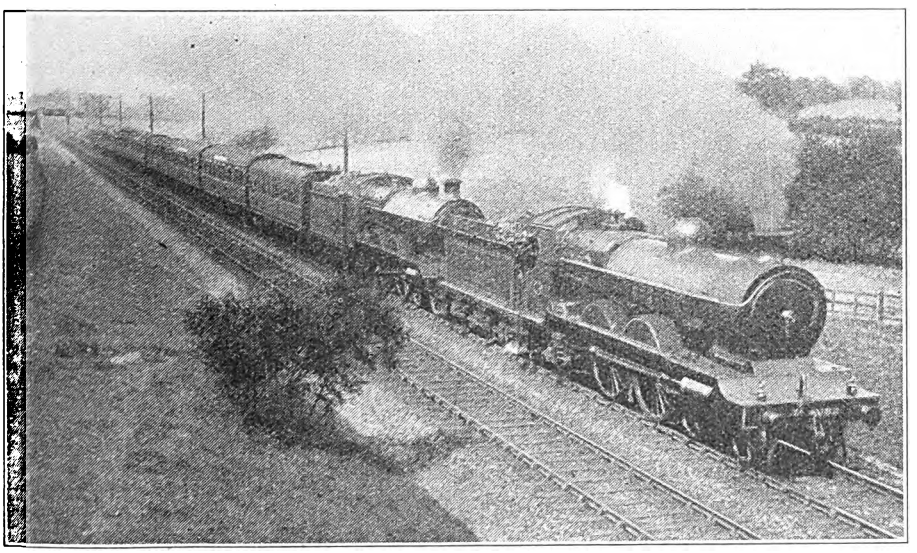

Photo.] [*J. F. Dearden.*

L.N.E.R. UP MANCHESTER EXPRESS NEAR WOODFORD AND HINTON.

Great Central locomotives Nos. 192 and 6086.

Now come the runs on the considerably heavier Scotch expresses. No. 2404, on her first journey, did nothing worthy of remark, only touching 66 an hour at

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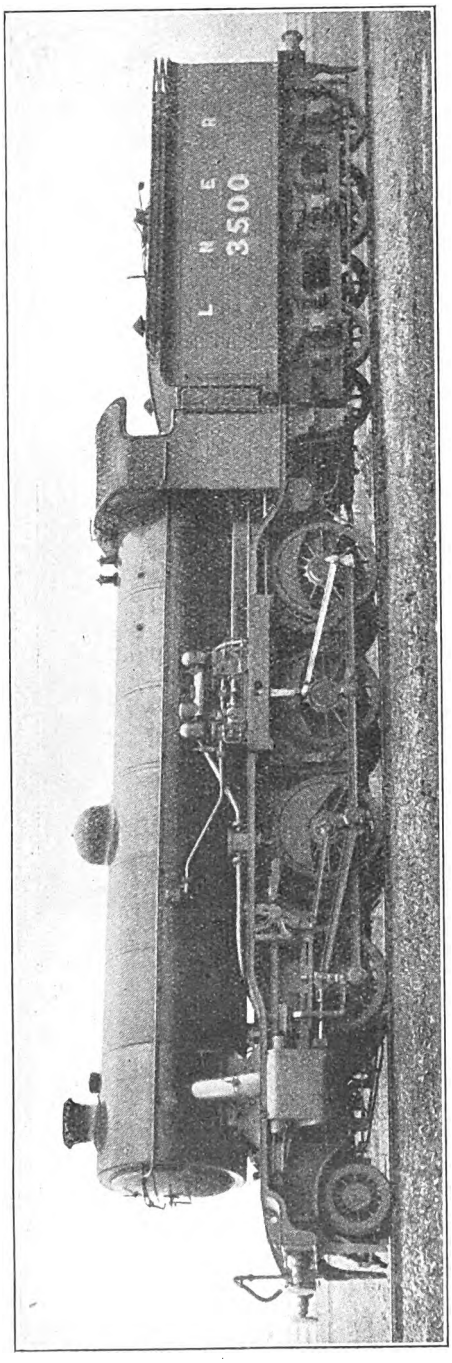

L.N.E.R. THREE-CYLINDER 2-8-0 LOCOMOTIVE NO. 3500, FITTED WITH "DABEG" FEED-WATER HEATER AND PUMP.

Danby, and 67 at Thirsk and Alne, but with the good start to Eryholme this was sufficient to economise $2\frac{3}{4}$ min. on a schedule of 49 min. No. 2403, on the next journey, passed Eryholme at $55\frac{1}{2}$ m.p.h., touched $71\frac{1}{2}$ at Danby, and after passing Northallerton at 68, attained 74 m.p.h. at Thirsk, but after that the engine was unfortunately eased; even so the net time did not exceed $45\frac{1}{2}$ min. No. 2404 had a very heavy train on her second trip, and reached 65 m.p.h. at Danby, 68 at Thirsk and 66 at Alne—not a particularly energetic exhibition, although a net gain of 2 min. was registered.

The Great Northern "Pacifics" were responsible for the fastest running, their net time to York working out at 45 min. 20 sec. against the North Eastern 46 min. 15 sec., although their average loads were only 355 tons against 390 tons. No. 2569 maintained $55\frac{1}{2}$ m.p.h. from Croft to Eryholme, touched 68 at Danby, fell to $64\frac{1}{2}$ at Northallerton, reached $72\frac{1}{2}$ at Thirsk, and again at Alne, with 68 intermediately at Sessay and finally at Beningbrough. Actual time on this journey was only $45\frac{1}{4}$ min., and net time about $44\frac{3}{4}$ min. No. 2568 also ran very well, with speeds of $52\frac{1}{2}$ m.p.h. at Croft and Eryholme, 68 at Danby, 66 at Northallerton, $72\frac{1}{2}$ at Thirsk, 68 at Sessay, $71\frac{1}{2}$ from Raskelf to Alne, 69 at Beningbrough and 66 at Poppleton; with the start of the previous trip we could have completed the journey in $44\frac{1}{4}$ min. Then No. 2572, on the last journey, did what was in parts the best running of the series, considering the load. We accelerated from 57 m.p.h. at Croft to 60 at Eryholme, and touched $71\frac{1}{2}$ at Danby before easing to 64 over the troughs; then we worked up to 75 an hour at Thirsk—fine work, this, with 400 tons—after which the engine was eased till we fell to 66 at Pilmoor; the final maximum was $70\frac{1}{2}$ at Alne, and then the engine was drastically eased for the best of the run. But the times were the best of all the "Pacific" trips with the Scotch trains as far as Tollerton. Thus it is clear that these big engines are no less capable in their work over level roads than they are over an undulating main line such as the Great Northern section of the L.N.E.R. from London to Doncaster, when they are permitted thus to show their paces.

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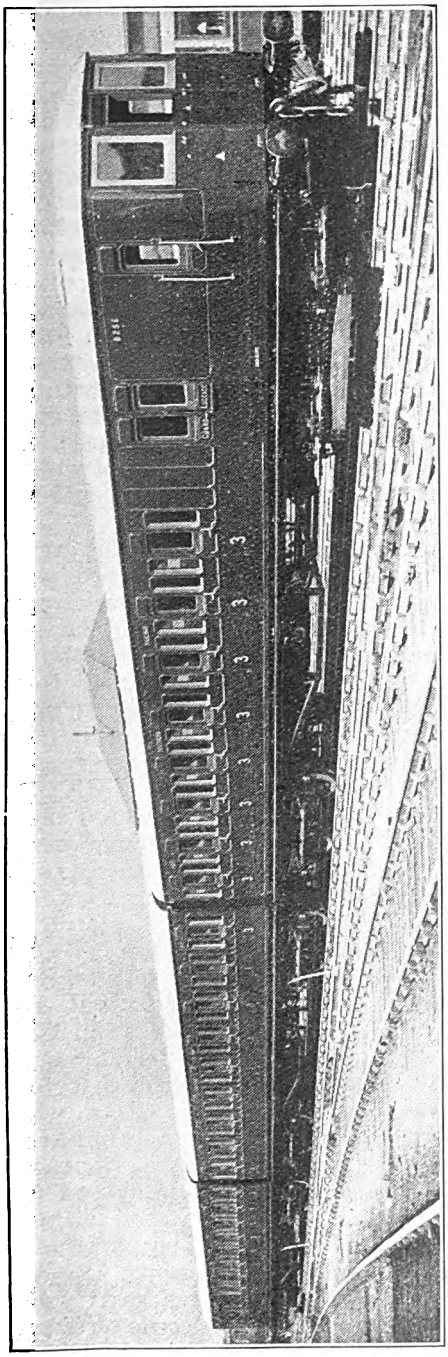
"A Greater Electric": Southern Railway.



GENERAL VIEW OF THREE-COACH UNIT FOR ELECTRIC SERVICES, SOUTHERN RAILWAY.

IN view of the fact that preparations are now well advanced for the opening of traffic on further sections of the "Brighton" electric system, to be followed very shortly by the inauguration of electric traction on certain South Eastern and Chatham suburban routes, a visit recently paid to Ashford and Brighton works to inspect the rolling-stock prepared for electric working was a matter of general interest. Recognising the magnitude of the electrification works in hand, it becomes easy to realise that the preparation of the rolling stock alone has constituted a big undertaking. So far as the new "Brighton" routes are concerned, new vehicles required are largely being supplied by contract. For the South Eastern and Chatham section, however, a large part of the new rolling-stock is being provided by the "conversion" and adaptation of steam rolling-stock. Under the latter heading, in fact, no fewer than 537 out of a total of 850 vehicles is required. Many of these, it is interesting to note, utilise material from older type steam vehicles, in that upon standard 62-ft. steel underframes the bodies of two six-wheeled coaches are joined together. This is, however, a very approximate statement, in that, to a great extent, the "conversion" amounts to a little more than the use of old material; and when the vehicles are running it will be almost imposible to distinguish converted from entirely new vehicles, since the construction and equipment, even if using old material, will be to all intents and purposes new and up-to-date.

In many respects the new trains will correspond very closely with those already in service on the London and South Western electric routes. Standard three-coach units will be used, and at busy periods two of these will be run together to form a train, with two non-motor vehicles between as required, these also being in accordance with what is now a standard practice on the London and South Western section. Electrical equipment, too, will correspond, in that the motor compartments at the end of each

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unit will be of standard type, these portions also being steel panelled. The end of each unit is motor equipped, so that for each three-coach set there will be four motors, two on one bogie at each end. Vehicles will be connected by M.C.B. automatic couplers, with brake hose connections and cables for electrical purposes. The motor bogies are equipped with beams to carry the collector shoes as usual.

While referring to the electrical equipment, it may be pointed out that although, in general, so far as the South Eastern and Chatham section is concerned, electrification will utilise the running rails for current return, the positive conductor rails being placed outside, on some sections it has been necessary to provide a fourth "idle" rail so as to amplify the return capacity, where, owing to the distance from sub-station, the running rails do not provide sufficiently therefor.

The new trains are upholstered and equipped on lines which will certainly satisfy the ideas of the most particular season-ticket holders and regular travellers. The first-class compartments will seat four passengers on each side, with midway arm rests, and the third-class compartments five on each side. Special attention has been paid to lighting, which is distinctly on the generous side. The new trains will have very much the same appearance as those in use on the London and South Western section, except that the ends of the motor coaches are rounded to a lesser extent and that constructional details correspond more with South Eastern and Chatham carriage practice. Some of the vehicles to be run between the two units are, however, adapted from "Brighton" section vehicles. An important feature is the generous luggage space provided in the guards' compartments, this being necessary owing to the large amount of miscellaneous traffic which has to be worked on many of the suburban routes. Westinghouse brake equipment is installed.

Most of the conversion, including the construction of the new steel underframes, has been carried out at Ashford Works, where certain shops have been partially converted from ordinary locomotive and carriage work to meet the needs of the electrification rolling-stock programme. A certain amount of work has, however, been done also by contract firms. At Brighton one of the old paint shops is being utilised as a centre for equipping the new vehicles with their electric plant. The building has proved eminently suitable for this purpose, and when the need for its utilisation in this manner has come to an end, it will form one of the best-equipped carriage-cleaning shops in the British Isles.

It may be pointed out that the electrification of the suburban area of the Southern Railway is the biggest thing of the kind ever undertaken, and when complete will consist of 650 miles of electrically operated track, involving a cost amounting to nearly eight million pounds. In connection with this change, and as a result of the considerably augmented service of trains which it will be possible to run, orders were placed for the construction of about 850 new carriages, 537 of which are intended for use on the S.E. and C. sections.

The first of the extensions of this great electrification scheme to be opened will be the old "Brighton" routes from Norwood Junction and Balham to Sutton and Coulsdon North, representing about 82 track miles. It is hoped that this will be opened early in April. This portion will be worked on the overhead principle, in the same way as the existing services on the "Brighton" section.

In this connection we may mention that whereas the present electric trains used on the "Brighton" section provide seating accommodation in the same vehicles as those which accommodate the electrical plant, most of the new trains will have as a basis a motor van with both bogies carrying motors, so that there will be four motors all under one vehicle. The spare space will be utilised for luggage, thus providing accommodation therefor on a more generous scale than was practicable when small luggage compartments only were available in separate vehicles. Passengers will be conveyed in trailer coaches, usually two on either end of the motor coach, but variable according to traffic requirements.

Reverting to the South Eastern and Chatham section, in July electric services will be inaugurated between Victoria, Holborn Viaduct and St. Paul's to

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Orpington, both *via* Nunhead and Catford, and *via* Herne Hill and Beckenham Junction. This will involve a total of 115 track miles. At the same time it is hoped to open an extension of the electrified system on the South Western section from Claygate to Guildford, and also from Raynes Park to Guildford *via* Leatherhead and Effingham Junction. The old Brighton line from Leatherhead to Dorking North is also included in this particular section—67 track miles.

In December next it is anticipated that a further portion of the South Eastern section will be ready for conversion, from Charing Cross and London Bridge to Orpington, and the line from St. John's and Lewisham Junction down to Addiscombe Road, as well as the Hayes and Bromley North branches—in all, about 76 track miles.

The final section is due for conversion early next year, and this comprises the line from Cannon Street to London Bridge, and the three lines serving Dartford, *via* Woolwich Arsenal, *via* Bexley Heath, and also *via* Eltham and Sidcup—about 62 track miles.

It is claimed that when the scheme is complete suburban travellers south of the river will have an electric system not only superior to that in any other part of London, but constituting the most elaborate and extensive series of electrically operated lines of a comparable character to be found anywhere in the world.

Automatic and semi-automatic signalling with colour light signals is also being installed, and it is anticipated that by electrification, in conjunction with the increased possibilities afforded by automatic signalling, it will be possible in many cases to run three electric trains where one steam train does duty now, as well as to realise higher average and running speeds and to facilitate the operation of traffic generally.

VETERAN LOCOMOTIVE STILL AT WORK.

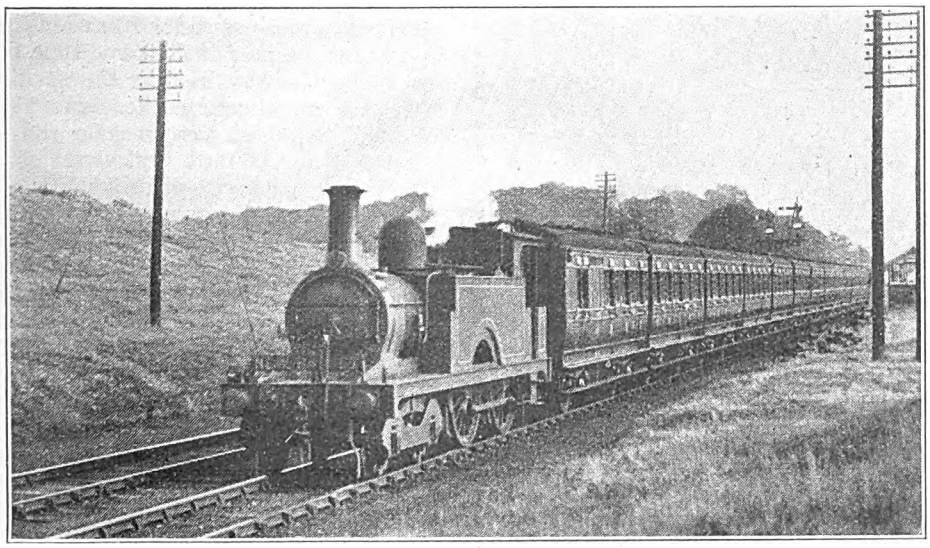

Photo.] [*F. R. Hebron.*

NORTH LONDON TRAIN HAULED BY ONE OF THE LAST REMAINING INSIDE CYLINDER ENGINES.

4-4-0 tank locomotive No. 2874.

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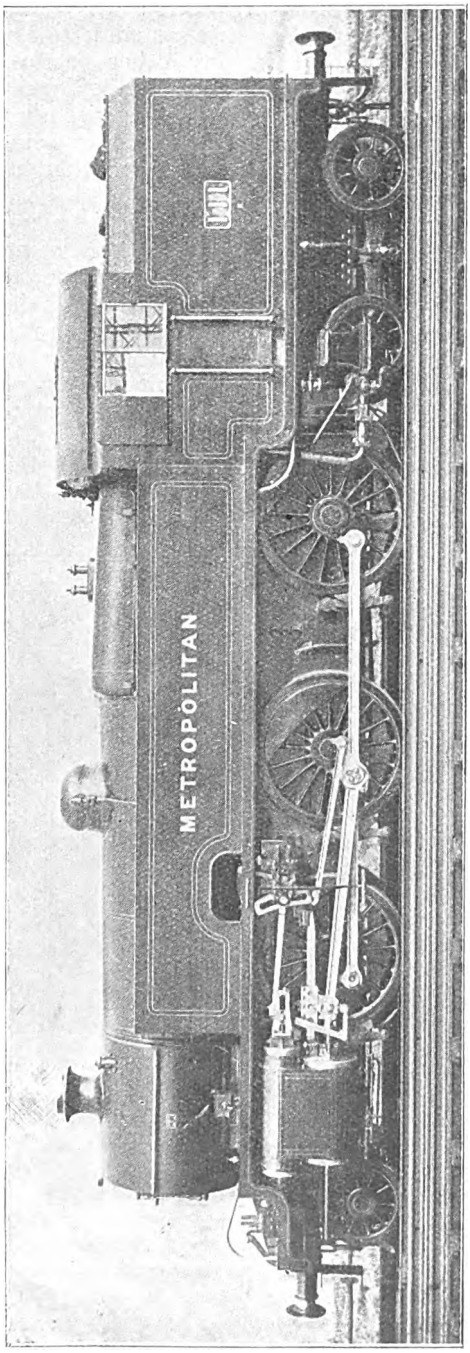
2-6-4 Tank Engines, Metropolitan Railway.



METROPOLITAN RAILWAY 2-6-4 TANK ENGINE FOR MAIN LINE GOODS TRAFFIC.

BY courtesy of Mr. John Wardle, Commercial Manager, Metropolitan Railway, we are enabled to illustrate and describe some new 2-6-4 tank engines which are being placed in service for hauling goods traffic between Finchley Road and Verney Junction. The engines, which are of considerable size and power, were supplied completely finished and ready for service by the George Cohen Armstrong Disposal Corporation, the work being carried out by Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle. Certain parts of the engines were supplied by Woolwich Arsenal out of the stock of locomotive components manufactured there in 1920 to the designs of Mr. R. E. L. Maunsell, Chief Mechanical Engineer of the Southern Railway; whilst other parts were manufactured by Armstrong, Whitworth & Co. to the design of Mr. G. Hally, Chief Mechanical Engineer of the Metropolitan Railway Company, under whose inspection the engines were erected and completed in Newcastle.

The locomotives differ from Mr. Maunsell's tank engines of the same type on the Southern Railway in that the spacing of the coupled wheels is the same as that of the 2-6-0 tender engines on that line, whereas the Ashford tank engines have the coupled wheels placed more closely together. As the parts available from Woolwich were those of tender engines only, it was necessary to maintain the spacing of the coupled wheels in order to use in the existing frames. These frames have been lengthened to take the bunker supported by the trailing bogie, the total overall length of the engines being 44 ft. 10¾ in. The cylinders, placed outside the frames, measure 19 in. by 28 in., and steam is distributed by piston valves actuated by Walschaerts gear. The boilers were made by George Stephenson & Co., Darlington, and are fitted with one live steam Gresham & Craven injector, and one exhaust steam Davis & Metcalfe injector. The safety valves are of the Ross patent "pop" type. The cylinder release gear was specially designed

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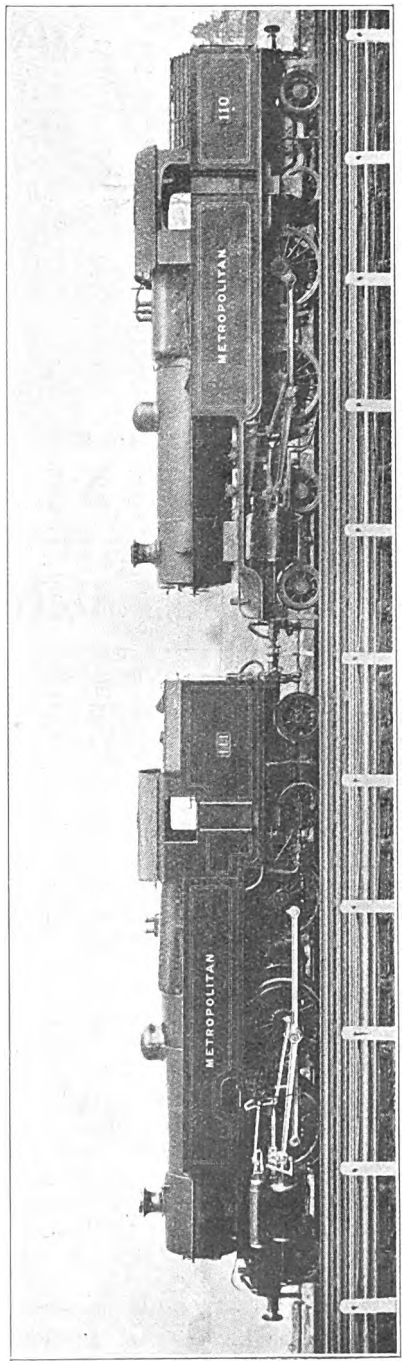
to afford ample clearance over the positive conductor rails on the electrified lines. The engines have been designed to take 4½ chain curves. The trailing bogie is a duplicate of those already in service on the Metropolitan Railway, and the wheels, tyres, axles and axleboxes are exactly the same as those used on the leading pony truck.

The leading particulars are as follow :—

Cylinders	19 × 28 in.
Wheels, front bogie, diam. ..	3 ft. 1 in.
,, coupled, diam. ..	5 ft. 6 in.
,, trailing bogie, diam.	3 ft. 1 in.
Wheelbase, coupled	15 ft. 6 in.
,, total	36 ft. 7 in.
Heating surface—	
Firebox	135 sq. ft.
Tubes	1,390·6 sq. ft.
Total	1,525·6 sq. ft.
Superheater	285 sq. ft.
Total	1,810·6 sq. ft.
Grate area	25 sq. ft.
Boiler working pressure ..	200 lb. per sq. in.
Tank capacity (total) ..	2,000 gallons.
Fuel capacity	4 tons.
Weight, in working order ..	87 tons 7 cwts.

The photograph showing the new 2-6-4 type engine, together with the 4-4-4 type of the Metropolitan Railway, is of interest in the comparative sense, showing as it does the increased proportions of the new locomotive, and also emphasising the fact that with the new engines in use the company possesses two advanced types of tank engines admirably suited in every way for handling passenger and goods traffic over their steam operated lines.

On the next page particulars are given of the various classes of steam locomotives employed on the Metropolitan Railway. These include two classes of the old 4-4-0 engines, together with the little-known 2-4-0 and the earlier 0-4-4 locomotives, some of which have been sold. Also the 0-6-0 shunting engines used at Neasden and the relatively modern 0-6-2 and 0-6-4 locomotives. The list is completed by the standard 4-4-4 passenger and the new 2-6-4 goods engines. The particulars thus given in collected form constitute a useful and interesting addendum to the description of the new class described above.



METROPOLITAN RAILWAY 2-6-4 AND STANDARD 4-4-4 TANK ENGINES.

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Class	Shunting Loco.	A.	B.	C.	D.		E.	F.	G.	H.	K.
Type	0-6-0	4-4-0	4-4-0*	0-4-4*	2-4-0*	2-4-0*	0-4-4	0-6-2	0-6-4	4-4-4	2-6-4
Heating surface— Small tubes (sq. ft.)	644	841	864	1,050	1,005	1,000	1,050	1,050	765	765	1,034
Large tubes ,,	—	—	—	—	—	—	—	—	281	281	356·6
Firebox ,,	68	101·6	94·7	95·6	86	93	95·6	100	132	132	135
Total ,,	712	942·6	958·7	1,145·6	1,091	1,093	1,145·5	1,150	1,178	1,178	1,525·6
Superheater ,,	—	—	—	—	—	—	—	—	268	268	285
Grate area ,,	13·25	19	17·2	16·7	14·4	16·74	16·7	17·9	21·2	21·2	25
Boiler pressure (lb. per sq. in.)	140	160	160	160	160	160	160	160	160	160	200
Adhesion weight (tons)	39	34	36·7	31·95	31·2	33·3	33	47·5	52·6	39	54·8
Tractive force at 85 per cent. working pressure (lbs.).	14,550	13,500	13,500	15,480	14,970	14,970	16,400	18,000	20,498	18,498	26,040
Cylinders (in.)	16×22	17×24	17×24	17×26	17×24	17×24 {17, 17½} ×26	17½×26	20×26	19×26	19×28	
Water capacity (galls.)	1,160	1,170	1,170	1,050	800	800	1,300	1,430	2,000	2,000	2,000
Coal capacity (tons)	1·25	1·5	1·25	1·8	1·8	1·8	2·2	2·5	4½	4½	4
Weight in running order ,,	39	45	46·6	50·4	41·2	43·5	54·5	56	73	77	87·4
Diameter of driving wheels	3 ft. 10 in.	5 ft. 10 in.	5 ft. 10 in.	5 ft. 6 in.	5 ft. 3 in.	5 ft. 3 in.	5 ft. 6 in.	5 ft.	5 ft. 9 in.	5 ft. 9 in.	5 ft. 6 in.

* These engines have been sold.

Table showing Principal Particulars of Metropolitan Railway Steam Locomotives.

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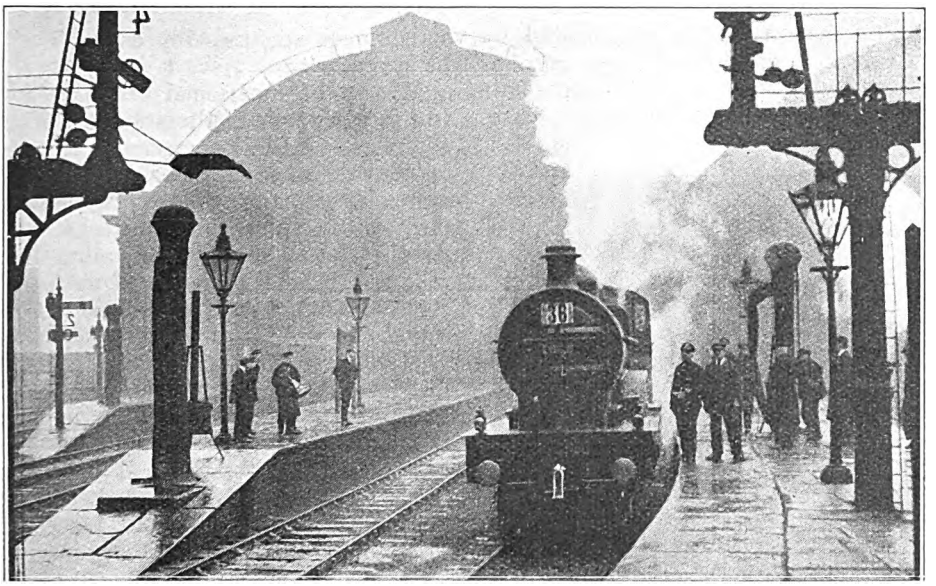

Photo.] [*Topical.*

LONDON-BRADFORD INAUGURAL TRAIN AT BRADFORD (EXCHANGE).

New Rolling-Stock for Main Line Services, L.M.S.R.

ALTHOUGH not quite the fastest service ever given by the Midland route, in that before the war there was one up express from Bradford to St. Pancras in 4 hours 13 min., new expresses inaugurated on March 2, running direct from St. Pancras to Bradford (Exchange) *via* Thornhill, represent a development in traffic facilities of special importance. Associated therewith is the fact that the new trains, which are booked in 4¼ hours, an acceleration of about 20 min. on the present best times, call only at Leicester and Sheffield intermediately. Also they are made up of rolling-stock of new design, all passenger coaches being of dining-car type, and fitted throughout with tables, while the central kitchen car is able to supply, if need be, every passenger in the train with lunch, tea or dinner, as the case may be, at one sitting.

As the new service is essentially designed to meet the needs of the considerable business travel between Bradford and Sheffield and London, the up train is booked to leave Bradford (Exchange) at the convenient time of 9.10 a.m. and Sheffield at 10.15 a.m., reaching St. Pancras at 1.25 p.m., thus allowing for a full afternoon's business in London before making the return journey from St. Pancras at 4.55 p.m. The down service is correspondingly convenient, in that Sheffield is reached at 8.5 p.m. and Bradford at 9.10 p.m., while the service will, no doubt, be equally appreciated by Leicester passengers, who will thus be given a non-stop service in 107 min., at a time particularly suitable for returning business men.

So far as the schedule in detail is concerned, it may be mentioned that the 99 miles between St. Pancras and Leicester are booked in 108 min. up and 107 min. down, the 59¼ miles between Leicester and Sheffield are allowed 78 min. up and 79 min. down, while the complicated 39½ miles between Sheffield and Bradford are allowed 60 min. up and 61 min. down. Seeing that from Trent Junction northwards the route, like most of those in the

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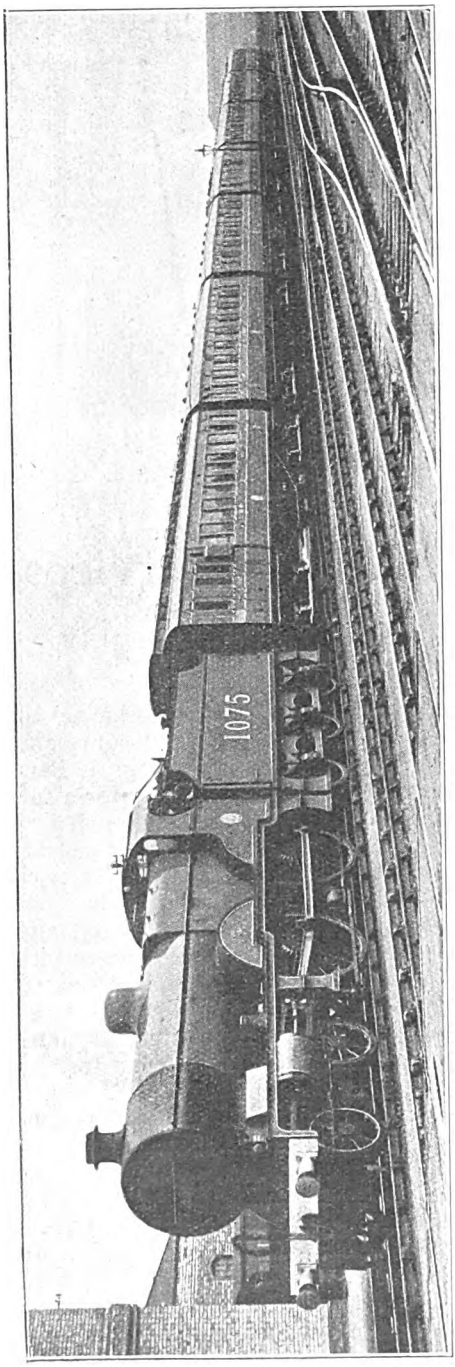
busy area concerned, is complicated by the frequent need for reducing speed at junctions and for curves, and the gradients in many places are by no means easy, these times are probably as good as can be given.



TRAIN OF VESTIBULED CENTRAL-CORRIDOR COACHES AND KITCHEN CAR FOR NEW LONDON-BRADFORD SERVICES, L.M.S.R.

It may be mentioned that, on a trial run recently, one of the standard Midland compound 4-4-0 locomotives, No. 1036, on a slightly easier schedule, usually ran appreciably before time, notwithstanding one or two intermediate checks. Thus, on the down journey, 109 min. 10 sec. (allowed 111 min.) were taken from St. Pancras to Leicester, including one bad signal check; the time from Leicester to Sheffield was 77 min. 20 sec. (scheduled in 79 min.); and from Sheffield to Bradford, including delays, 66 min. 25 sec. On the up journey the same engine ran from Bradford to Sheffield in 57 min. 40 sec., from Sheffield to Leicester in 78 min. 20 sec., and from Leicester to St. Pancras in the exact 108 min. From the locomotive point of view the new service is an easily practicable one, and no doubt time can be kept with a substantial increase in loading.

Principal interest attaches, however, to the rolling-stock employed. The new Bradford train includes six passenger coaches, arranged three on each side of the kitchen car. In one direction there is a first-class car, together with an ordinary third and a brake-third coach. At the other end all three vehicles are intended for conveying third-class passengers. All vehicles are of central gangway type; each is in two sections—smoking and non-smoking—and every seat in the train has table equipment. There are seats for 234 third-class and 36 first-class, or a total of 270 passengers, while the kitchen has a capacity for about 250 meals. Obviously, in the ordinary way, passengers who are taking lunch or dinner will be concentrated, as far as possible, in the vehicles immediately adjacent to the kitchen car, but if there is sufficient demand the kitchen car staff will be prepared to serve meals in any part of the train, and gangway widths and vestibule dimensions are designed so as to facilitate the movements of waiters, even should they require to travel the comparatively considerable distances involved in serving passengers in the farther cars. Even if not required for meal purposes the tables will no doubt be appreciated very greatly by passengers, in that business men will be able to

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attend to correspondence, &c., while travelling, or, if there is no need for that, the table will be useful as a support for one's book or paper.

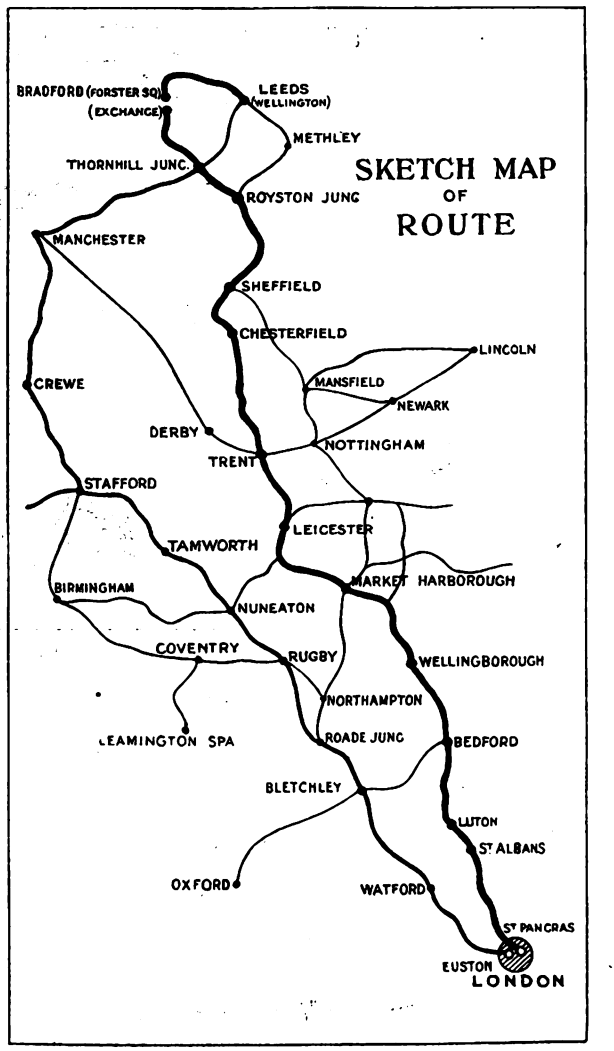
Another point of interest is that some, if not all, of the third-class cars have practically the same seating and other dimensions as the first-class cars, so that no inconvenience arises when two passengers (particularly if substantially built) are seated on the same side of a table, as it does in some third-class dining cars, which may at times be somewhat uncomfortably crowded for this reason. A great point is, moreover, that, notwithstanding the comfort of the seating accommodation and the high quality of the appointments and fittings throughout the train, no charge is incurred beyond the payment of ordinary fares. Further, the third class cars are finished in polished mahogany, and trimmed in York velvet, and the metal fittings finished Venetian bronze. All ceilings are enamelled glossy white. Special attention has been given to the ventilation of the cars by means of adjustable louvre ventilators, electric fans, drop lights in convenient positions, and "torpedo" air extractors in the roof.

The kitchen car is utilised for cooking and culinary purposes only. Every convenience is provided for the chef and train staff, to facilitate the serving of 250 meals at one sitting. The vehicles are electrically lighted from dynamos driven from the carriage-axles, accumulators being provided to give light when the train is stationary. Lamps carried in electroliers of tasteful design are arranged in the ceiling and over each table. For the purpose of minimising noise, the floors are covered with felt under the linoleum. An efficient steam-heating system has been provided, and is under the control of the passengers.

At the ends of the coaches, in addition to conveniently arranged lavatories, supplied with both hot and cold water, space is provided for racks for passengers' personal luggage, which is thus kept within sight but clear of the seating part of the coach.

In general construction the passenger vehicles correspond. Each coach is 57 ft. over the body and 9 ft. 1½ in. wide as a maximum. Each bogie has a wheelbase of 9 ft., and the distance between the bogie centres is 40 ft. 6 in. The third-class cars each have a seating capacity for 56 passengers, and in the case of first-class cars 36 can be accommodated. The weight of each vehicle is 27 tons.

The kitchen car, which weighs 29 tons, includes a central kitchen equipped with a large gas stove, hot-plate of generous



SKETCH MAP OF ROUTE.

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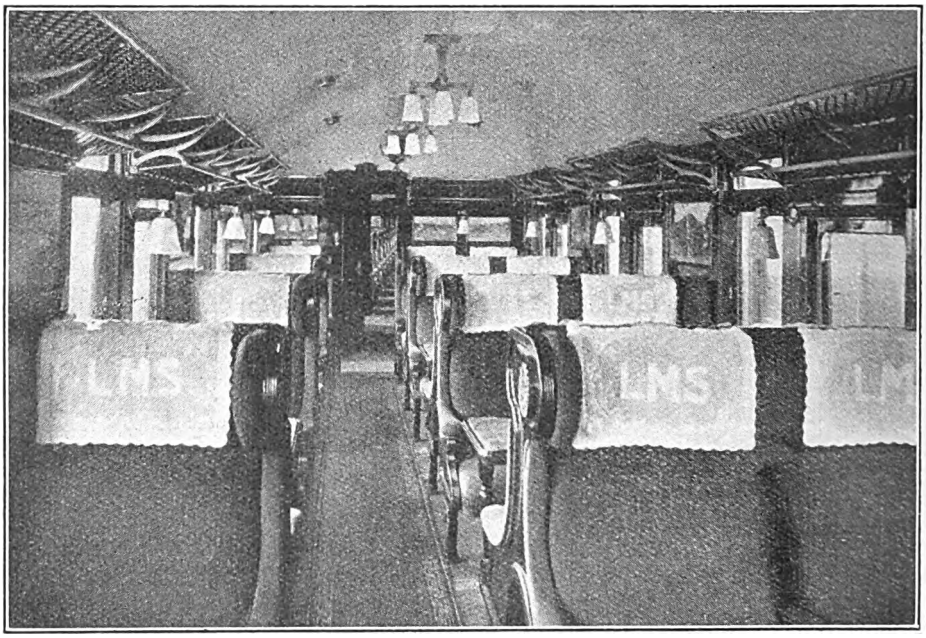
dimensions, and two hot-water boilers, one for washing and kitchen purposes and the other for tea-making, &c. On either side of the kitchen section are pantries, and in addition there is a seating compartment for the kitchen staff, and toilet facilities. There is also a plate-warming cabinet with a capacity for 500 plates, together with refrigerators, wine coolers, &c.

On the occasion of the trial journey mentioned above, the party was accompanied by Mr. J. H. Follows, C.B.E., Chief General Superintendent; Mr. R. W. Reid, C.B.E., Carriage and Wagon Superintendent; Mr. T. C. Jeffrey, Superintendent of Publicity and Advertising; Mr. C. F. Graseman, Publicity Liaison Officer, General Manager's Department; Mr. J. Walker, and others.

Commencing on March 2, the 10 a.m. service from Euston to Glasgow, Edinburgh and the North was scheduled to run in two sections, the Glasgow portion leaving at 10 a.m. and the Edinburgh and North section at 10.8 a.m. At the same time entirely new sets of vehicles were provided. In the case of the Glasgow section, the make-up is in general similar to that of the new trains introduced for the London-Bradford service described above, modified slightly to meet the requirements of this particular traffic.

The make-up includes a central kitchen car, together with one central-corridor first-class carriage, one corridor first-class vehicle, two central-corridor third-class coaches, and a corridor-brake third, together with a brake van. There is thus a compromise between the arrangement adopted for the Bradford train, in that the Glasgow train is not entirely made up of semi-open vehicles of dining-car type.



INTERIOR OF FIRST-CLASS COACH.

Ample luggage accommodation is provided, while the capacity of the kitchen car is sufficient to enable every passenger in the train to be served simultaneously, if required. Normally, this is hardly likely to be the case, but, however full the train may be, there is sufficient table accommodation to enable all passengers who may desire to take lunch or tea to be accommodated at one sitting. The needs of passengers joining the train by means of attached through coaches or other vehicles which may be included in the make-up during the journey can also be supplied. The standard make-up

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provides for 72 first and 138 third-class passengers.

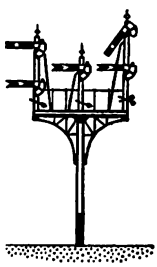
In the case of the Edinburgh section, five vehicles provide a basis for the train, including a vestibuled first-class carriage, a combined first-class and kitchen car, a vestibuled third-class vehicle, a corridor-brake composite and a corridor-brake third. Seating accommodation is provided for 68 first and 114 third-class passengers. In running, the Aberdeen and Dundee vehicles are, of course, attached to the Edinburgh portion.

As in the case of the Bradford train, the generous provision of tables constitutes a special feature of the new sets, combined with the ability to serve meals at one sitting, instead of in relays, as was so often necessary. Other special features are that the fullest advantage has been taken of the maximum width allowed in order to make the compartments as commodious and comfortable as possible. The first-class vestibuled cars are finished in polished walnut and trimmed in blue cloth, and all metal fittings are of oxidised silver. The third-class vestibuled cars are finished in polished mahogany and trimmed in York velvet, and the metal fittings finished Venetian bronze. All ceilings are enamelled glossy white. Special attention has been given to the ventilation of the cars by means of adjustable louvre ventilators, electric fans, drop lights in convenient positions, and "torpedo" air extractors in the roof.

The vehicles are electrically lighted from dynamos driven from the carriage axles, accumulators being provided to give light when the train is stationary. Lamps carried in electroliers of tasteful design are arranged in the ceiling and over each table.

There is lavatory accommodation, with a plentiful supply of hot and cold water, in every coach. At the end of each vehicle ample room for storing passengers' personal luggage is provided. For the purpose of minimising noise, the floors are covered with felt under the linoleum. An efficient steam-heating system has been provided, and is under the control of the passengers.

Although the Edinburgh portion on the down journey is now run behind the Glasgow section, the standard arrival time at Edinburgh (Princes Street) is maintained. The Glasgow and Edinburgh trains run together from Crewe on the up journey. The new trains have been constructed to the designs of Mr. R. W. Reid, C.B.E., Carriage and Wagon Superintendent, L.M.S.R., at the Derby Carriage Works.



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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications or information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 33, *Tothill Street, Westminster, London, S.W.*1. *No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book"* (5*s. net*) *should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

King's Norton Station, L.M.S.R.

In further reply to your query, Mr. C. D. Macklow writes (sending also a sketch, not reproduced) as follows: King's Norton is at the junction of the Five Ways and Camp Hill lines from Birmingham, and between this station and Barnt Green the traffic is very heavy, Barnt Green being the junction for Redditch and Worcester and Bristol. The embankment has been pushed back so that a double set of rails may be laid and additional platform space may be provided, and the curve at the junction will be reduced so that expresses will not have to slow down so much as they have to do now. Further, the earth taken away from the station has been utilised in building up the embankment so that an additional set of rails may be laid to Northfield, the next station. The single line between Barnt Green and Redditch is to be made double. It is thought that a bridge may be built over the railway instead of a level crossing before the roadway bridge is commenced, as this has to be widened in width and in span. Improvements on the platforms will be started upon in time. These improvements will not be finished for a long time to come, as much of the work of the bridges has yet to be started, although the new track is nearly levelled.

[Further reply to K. NEWMAN.]

Double Track on the L. & N.W.R.

Increase of goods traffic consequent upon the opening of the Midland Railway to Rugby necessitated the L. and N.W.R. providing an additional up line for goods trains, to prevent delay to passenger trains. The third line was laid between London and Bletchley, but to save the expense of an additional tunnel, the two up lines were "gauntleted" through Watford Tunnel. Later, the third line was adapted for passenger traffic, the section from Bletchley to Tring being used for passenger trains from May 3, 1866. A fourth line was opened from Willesden to Bletchley in April, 1876, and that from Chalk Farm to Willesden in June, 1879, the construction of the second tunnel under Primrose Hill having caused this section to occupy a long time in construction. The provision of four tracks between Bletchley and Roade was completed in August, 1881, and the construction of a loop line from Roade to Rugby *via* Northampton about the same time completed the provision of four roads between London and Rugby.

[Reply to ALAN PECK.]

Widened Lines, Forest Hill Bank, S.R.

The London and Croydon Railway obtained powers in 1844 to widen the line for atmospheric traction. Only one tube

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was laid down between Forest Hill and West Croydon on the up side; but, according to contemporary records, the overbridges between Forest Hill and New Cross were altered to allow of the laying of an additional set of rails on each side. There were then six overbridges between New Cross and Forest Hill, one, we understand, much nearer New Cross than the Vesta Road bridge. We remember one being pulled down about 25 or so years ago. If the plan of alteration of overbridges as proposed was carried out to the bridge mentioned in "London and Londoners in the Eighteen Fifties and Sixties," there should have been amply sufficient space for the extra set of rails, as the alteration added about 13 ft. to the width available.

[Reply to J. M. ADAMS.]

West End and Crystal Palace Railway.

In 1853 a company was incorporated to construct a line from Clapham Junction to the Crystal Palace, with a continuation to the L.B. and S.C. Rly. at Norwood. This railway was named the West End of London and Crystal Palace Rly., and, presumably, when Mr. R. Bennett mentioned the "Crystal Palace Co." working the line to Norwood, he meant the W.E.L. and C.P. Rly. Co. and not the company owning the Crystal Palace. The W.E.L. and C.P. Rly. subsequently obtained powers to construct a railway from its Norwood spur to the Mid-Kent line at Beckenham, and L.C. and D. Rly. trains worked over this spur and the W.E.L. and C.P. Rly. from October 12, 1861. The L.B. and S.C. Rly. acquired by lease in 1859 the W.E.L. and C.P. Rly. (except the Beckenham Spur, which the L.C. and D.Rly. took over).

[Reply to J. M. ADAMS.]

Southern (S.E. & C.) 4-4-0 Engines.

The most powerful express locomotives on the South Eastern and Chatham section are the large-boilered series numbered from 760 to 781, inclusive, of which Nos. 772 to 781 inclusive were built by the firm of Borsig, Berlin-Tegel. These locomotives, which can always be easily distinguished from the rebuilt 4-4-0 engines by the straight running-plate from back to front (that of the rebuilds is raised over the coupled wheels), weigh 57½ tons without tenders, against the 52½ tons of the rebuilt engines, and it is this difference of 5 tons that bars the heavier engines, at present, from the Chatham route. The greater power of the latter class is expressed by 20½-in. by 26-in. cylinders, as compared with 19-in.; 1,731 sq. ft. heating surface against 1,532; and 22½ against 21¼-sq. ft. grate area.

[Reply to G. E. FENTON and L. J. POWER.]

Track Circuit.

We have explained this on a number of occasions. Briefly, an electric circuit is imposed on the running rails, which are insulated and bonded, so that only if an engine, train or vehicle is standing on the particular length of line are the two rails electrically connected. The resulting short-circuit is used for locking instruments or operating indicators to show that the particular section is occupied. On a track-circuited section the driver of a train kept waiting is not required to send his fireman to the signal-box, and an intimation is given either by a notice bearing the words "Track Circuit" or "Indicator in Box," or by means of a white diamond attached to the post, according to the practice of the particular railway. Lock and block partially serves the same purpose.

[Reply to R. PUTNAM.]

"Castle" Class Engines, G.W.R.

At the present time there are 11 engines of this type in service, including No. 111, *Viscount Churchill* (the converted *Great Bear*). We fear that by no stretch of the imagination could the "Director" class 4-4-0 engines of the L.N.E.R., G.C. section, be described as "equally as powerful as the 'Castle' class." A comparison with the "Pacific" engines of the L.N.E.R. is, however, on an entirely different footing. The respective overall lengths, including tender, of the types last mentioned are: G.W. "Castle," 65 ft. 2 in.; L.N.E. (G.N.) "Pacific," 70 ft. 5 in.; L.N.E. (N.E.) "Pacific," 72 ft. 4½ in.

[Reply to "CAERPHILLY CASTLE," "CORNISH RIVIERA," J. JAMESON and H. ROBERTSHAW.]

Weights of Rolling-Stock.

Speaking generally, you may assume that if the weights of railway passenger coaches are not given in our description

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thereof it is because that particular information has not been supplied. As far as possible, we endeavour to give information of this kind. Presumably, the differences in the connections for vestibuled vehicles belonging to various sections cannot be great; otherwise, it would not be practicable to couple up on through services. Uniformity in this respect will, of course, be necessary as the effects of grouping become more noticeable, and this is a matter which is receiving attention very generally.

[Reply to J. E. DANE.]

Pullman Cars.

Agreements between the Pullman Car Company and the various railways on whose lines the cars are run vary in each case, but in general it may be said that the cars are supplied and owned by the Pullman Company. A sufficient stock is maintained on each line, with a suitable number of spare cars, and these are shedded or kept in sidings with the ordinary rolling-stock of the railway concerned; at times of special pressure these cars may be transferred from one line to another as required, but the Pullman Car Company is doubtless responsible for the expense attendant on the transfer.

[Reply to "SUBSCRIBER."]

Southern (S.E. & C.) Locomotives.

Presumably you refer to the Stirling 4-4-0 locomotives of the old South Eastern Railway, a few of which are still running with domeless boilers as originally built. Several recent issues of the RAILWAY MAGAZINE have included references to these engines, and a view was reproduced in our issue of November, 1924, showing one of these engines still running with a domeless boiler. No book has been published dealing particularly with South Eastern and Chatham locomotives, and you would have to find particulars in the pages of the RAILWAY MAGAZINE or of our contemporary, *The Locomotive*.

[Reply to C. SIMMONS.]

London-Margate Steamers.

The *Crested Eagle*, the General Steam Navigation Company's new passenger steamer for the London-Margate service, will commence to run at Whitsun. She has been built for passing under London Bridge, but whether she will sail from Old Swan Pier depends upon the opposition line which leases the pier. Otherwise her London piers will be Greenwich and Woolwich. The *Crested Eagle* has been built by Samuel White & Co. of Cowes. She is of 3,500 i.h.p., steams 20 knots, and is the first steamer on the service to use oil fuel. She is licensed for 1,800 passengers.

[Reply to "B'TON CLERK."]

Somerset and Dorset Locomotives.

We are indebted to Mr. G. H. Wheeler, Traffic Superintendent at Bath, for the following information. The original engine No. 11 was a 2-4-0 tender locomotive sold in 1878 to the London and South Western Railway, and replaced by a 0-4-4 tank engine, which is still running. No. 27 was also a 2-4-0 tender engine, but was broken up in 1885 and replaced by a 0-6-0 tender engine, scrapped in 1914. No. 1 was originally a 0-6-0 tank engine, converted to a tender locomotive in 1888, and reconverted to a tank engine in 1908, in which condition it is still running.

[Reply to C. J. C.]

Mixed Traffic Locomotives, G.W.R.

There are several variations of the mixed-traffic 4-4-0 engines with 5-ft. 8-in. coupled wheels. The originals were the "Duke of Devonshire" class, followed by the "Camels," which gave rise to a number of subsequent series, all generally corresponding but having differences as regards frames, boilers, &c., according to the practice in force at the time they were built. When reboilered and rebuilt they have, however, become to a certain extent standardised. There are also a few older engines, such as the "Stella" class, with 5-ft. coupled wheels.

[Reply to A. P.]

Southern Railway (L.S.W.) Locomotives.

No book has been published describing London & South Western Railway locomotives in detail. The fullest information is contained in articles published in the RAILWAY MAGAZINE from time to time. A considerable number of new locomotives are on order, particularly of the 4-6-0 express class. At various periods, though scattered over many years, a considerable number of runs on the Portsmouth main lines have been described, though,

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naturally, it is only occasionally that a special section like this can receive attention.

[Reply to S. CHILD.]

S.R. Engines at Cricklewood.

A regular service of interchange freight trains is operated by the Southern Railway (South Western section) between Feltham Marshalling Yard and the L.M.S. (Midland) Brent Sidings at Cricklewood. The route is over the L.M.S. line between Kew Bridge and Feltham, *via* Acton Wells Junction; prior to grouping the section from Kew Bridge to Acton Wells was joint L.N.W., N.L. and Midland line (known as the North and South Western Junction Railway), and from there to Cricklewood it was Midland property.

[Reply to J. H. A. W.]

The Heaviest Coaches.

In reference to a reply under this heading in the February issue, Mr. L. Roberts points out that certain electric *motor*-coaches are heavier than the weights given, *e.g.*, Southern (L.B.S.C.) compartment type motor-coaches, 51½ tons; L.M.S. (L. and Y.) saloon type, variously 46, 50½, and 67 tons. Similar weights would be scaled by steam rail motor-coaches, but as in all these cases the weight is really that of a combined locomotive and coach, motor-coaches are probably beyond the scope of the query.

[Further reply to A. J. T.]

Kentish Town, L.M.S.

We cannot imagine where you obtained the details of the rough plan you sent of the lines as between Kentish Town (Midland) and Haverstock Hill, but they are certainly not correct. The general arrangement of the running lines is quite simple; as far as Hendon there are goods lines throughout on the south side of the main line, and slow lines on the north side, but the latter join the main lines between Carlton Road Junction and Finchley Road for the passage of Haverstock Hill tunnel.

[Reply to L. LINNELL.]

Reversible Working, Southern Railway.

The South London lines between London Bridge, L.B. & S.C. section, and South Bermondsey have for the last 12 years or so been laid out and signalled so that the centre line can be used for either up or down working. A particular direction is selected for specified periods of each day, and protective devices are provided so that only one arrangement can be used at the same time. There is, of course, no need for staff or tablet appliances under such conditions.

[Reply to "A 611."]

Paddington Station, G.W.R.

The arrangement is complicated by the fact that certain tracks are allocated for empty train movements, and we are unable to specify the exact details. "A" platform is an excursion platform and is rarely used for any other purpose, though at times milk and other traffic is dealt with there. It was built to relieve the main station from excursion and other traffic, and as a means of doing so has certainly justified its construction.

[Reply to "INTERROGATOR."]

Maximum Speeds.

The speed of 93·7 m.p.h. recorded in these columns by the late Mr. Chas. Rous-Marten, on the L.N.W.R., was in the descent of Shap incline, behind an "Experiment" class 4-6-0, as the "Prince of Wales" class engines were not introduced in his lifetime. The highest authenticated speed, to our knowledge, on the G.C. section of the L.N.E.R. was 90 m.p.h., and was recorded in Mr. Cecil J. Allen's article not many months ago.

[Reply to "R. E."]

Electric Vans, Southern Railway.

Mr. G. T. Moody mentions that for some time past a train including one of the electric vans mentioned has been used on Sunday services between London Bridge, Tulse Hill and Crystal Palace. He refers also to the probability that trains consisting of a motor van and two passenger trailers at each end will be used for the electric services to Sutton and Coulsdon North.

[Further reply to A. RANSON COWLISHAW.]

Running Powers, Manchester & Sheffield Areas.

The late London and North Western Railway was in possession of running powers over the G.C. line from Ardwick

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Junction (Manchester) to Sheffield, which are now assumed, of course, by the L.M.S. Co.; and this would account for your seeing a North Western locomotive at Crowden. It is difficult to pronounce on your other problem without some more precise details.

[Reply to "BONCHURCH."]

Large-boilered S.E. and C. 4-4-0 Engines, Southern Railway.

It is the intention to strengthen the bridges between Bromley and the Kent Coast in order that these and heavier engines may work over the route concerned. We believe they are already permitted to run between Victoria and Orpington. We note that you recently saw No. 775 working a local train between Faversham and Dover.

[Reply to F. A. G.]

L.N.E.R. Locomotives.

The "Garratt" articulated locomotive is not yet in service. As soon as it is, however, it will be illustrated and described in the pages of the RAILWAY MAGAZINE. We are not aware of "Pacific" locomotives working into Leeds, but these engines occasionally work on some of the auxiliary routes, and it is by no means improbable that now and then one does so.

[Reply to "ROCKET."]

Special Distant Signals.

Presumably the distant signal having a bar across the blade you have noted near Acton is intended to indicate that the particular arm has a special significance, either as a repeater or as a warning of level crossing gates opened or closed other than on strict distant signal lines. We have no information as to the significance in the particular instances noted by you.

[Reply to "GOLDERS GREEN."]

L.M.S. (L.N.W.) Locomotives.

We understand that the reason why a number of engines belonging to this section of the L.M.S. are still appearing from the works in the old plain black colours is to keep the cost of locomotive painting on this railway within reasonable limits of expenditure, *i.e.*, the number of engines completely repainted in each year is limited to a certain maximum figure.

[Reply to H. C. CASSERLEY.]

Southern Railway Locomotives.

2-6-0 Maunsell-design engines transferred to the South Western section are of the 2-cylinder type. We know of no history of the early locomotives of the late South Eastern Railway, other than that included in Mr. Ahrons' series of articles, which traced the later history practically up to the amalgamation of the S.E. and L.C. and D. lines.

[Reply to H. D. H.]

Train Working at Hereford.

Running powers over the section of line referred to were described in detail on page 382 of the RAILWAY MAGAZINE for November, 1909. This line was put in to permit of Barton station being made a goods depôt only. The avoiding line was added for this purpose as a matter of arrangement between the companies concerned.

[Reply to "BATHONIAN."]

4-8-2 Locomotive, Eastern Railway of France.

We hope to describe this engine in due course. Many of the newspaper references have been very much exaggerated, though the engine is a notable one, in that it has eight coupled wheels of 6 ft. 3-in. diameter and is intended for high-speed express service.

[Reply to "SOUTHERN E." and "INTERESTED."]

4-2-2-0 Locomotives, S.R.

These six engines were built by the late Mr. Drummond some 25 years ago. Their peculiarity is that they have uncoupled driving wheels, each with its own pair of cylinders. Until recently they ran frequently on main line duties, though we have not seen or heard of them as appearing on trains for some time.

[Reply to W. C. LIGHT.]

Safety-Balance Safety-Valves.

It is a fact that a few old Midland 0-6-0 side-tank engines were arranged with Salter's safety-valves on the dome, the spring-balance levers being arranged at right angles to the boiler centre-line, and not along the centre-line, but we are unaware as to what advantage, if any, was derived from the practice.

[Reply to R. H. CLEMENTS.]

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Indicator Shelters.

Presumably you saw Southern Railway (L.S.W.) 4-6-0 engine No. 742E running with an indicator shelter attached. A shelter of this kind is fitted when special tests are being made in order to accommodate men who are travelling on the front of the engine in charge of indicators and other appliances.

[Reply to "WESKEN."]

Ballindalloch and Tomintoul, L.N.E.R.

Great North of Scotland motor omnibuses run between these places, but although we believe proposals have been advanced for the construction of a railway, no action has ever been taken towards its actual making. We have no information as to any intention to revive the Halesowen service mentioned.

[Reply to W. B. N.]

Tractive Effort.

This expression has been so frequently explained in these columns that we can devote no further space to the subject. The formula was given in our issue of last January; this should only be multiplied by 2 in the case of four-cylinder simple engines, and in the case of three-cylinder simples by 1·5.

[Reply to S. DIESCH and "CLAUDIAN."]

L.M.S.R. Distances.

You can obtain information of this character by working out the distances as stated in *Bradshaw*, or, if you wish to be particularly exact, by consulting Mr. Allen's articles, so far as he has given this information when dealing with runs over the sections concerned.

[Reply to "WOODHOUSE."]

6.20 p.m. Express, Marylebone–Bradford.

To Leicester the passing times are: Northolt Junction, 6·37 p.m.; High Wycombe, 6·55 p.m.; Princes Risborough, 7.5 p.m.; Grendon Junction, 7.20 p.m.; Finmere (slip), 7.28 p.m.; Woodford (slip), 7.42 p.m.; Leicester, arr., 8.14 p.m.

[Reply to J. GIRARD.]

L.M.S. Locomotive Rebuilding.

The rebuilt 2-4-0 and 0-6-0 locomotives you have noted on the Midland and North Western Divisions of this railway have not been rebuilt with superheaters, but merely with Belpaire fireboxes, which are now to be standard on the L.M.S. system.

[Reply to C. PERFECT.]

Junctions.

The title "junction" in connection with a station has been more or less capriciously applied or withheld in this country where stations have any claim to such an appellation, and no definite rule could be laid down in the matter.

[Reply to "SUBSCRIBER."]

L.M.S.R. Signals.

We have no information as to standard signal details as adopted by the L.M.S.R., even if matters of this kind have been settled at all. The signal blades you have noted are of steel, and the "creases" are ribs for strengthening purposes.

[Reply to "KENSINGTONIAN."]

L.M.S. Liverpool and Hull Service.

Through running of L. and N.W. section engines beyond Leeds has been discontinued since the war. Engines of the L. and Y. section work into and out of Hull, however, on the Liverpool and Hull trains *via* Wakefield and Goole.

[Reply to BEN. FIELDING.]

0-8-2 Engines, Great Western Railway.

You are probably correct in pointing out that the Taff Vale Railway had no 0-8-2 tank engines. The reference to the Cardiff Valleys line may have been either to the Cardiff Railway or to the Cardiff Valleys section of the G.W.R.

[Reply to J. F. PARKER.]

Southern Railway Rolling-Stock.

As the new vehicles placed in service between London and Margate agree generally with those constructed some time ago for Continental traffic, they have not been described in detail in the pages of the RAILWAY MAGAZINE.

[Reply to L. G. PEGRUM.]

Locomotive Sheds, G.W.R.

Principal locomotive depôts with the indicating abbreviations are set forth in the *Railway Year Book*. A few copies of the 1924 edition can be obtained, price 5s., by post 5s. 6d. The 1925 edition will be published shortly.

[Reply to F. BROUGH.]

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L.N.E.R. (G.E.) Distances.

From Liverpool Street the distances are 51 miles 55 chains to Colchester, 68 miles 56 chains to Ipswich and 114 miles 78 chains to Norwich Thorpe. From Colchester to Thorpe-le-Soken is 13 miles 43 chains.

[Reply to "HACKERILL HALT."]

Continental Train Services.

For information of this kind please consult a Continental *Bradshaw* or other publication giving such particulars. With regard to the services you mention, we have no information beyond that given in press reports.

[Reply to W. R. J.]

The Fastest Train in Europe.

There is no present-day French schedule faster, in regard to its start-to-stop speed, than the run of the 7.10 p.m. ex Paddington, G.W.R., from Princes Risborough to Leamington, 52·9 miles in 51 min.

[Reply to J. H. A. W.]

Britannia Tubular Bridge, L.M.S.R.

The unfinished cutting you have noticed is probably one made to provide material for the approach embankment. We have no knowledge of any explanation such as that suggested by you.

[Reply to A. B. C.]

Maximum Railway Speeds.

We have frequently mentioned that the highest authenticated British railway speed —of 102·3 m.p.h.—was attained on the G.W.R. See the *Railway Year Book* for details.

[Reply to A. J. H.]

Through Locomotive Working.

It is not customary to work Great Western locomotives through from Paddington to Penzance without changing at Plymouth, and the paragraph to which you refer is in error.

[Reply to B. STEWART BROWN.]

L.N.E.R. Three-Cylinder Compound Locomotive No. 1619.

This engine is, we believe, still running in this form. At any rate, we saw it at York a few months back and it appeared then to be unaltered in any respect.

[Reply to R. G.]

Southern Railway Electrification.

We hope to describe the electrification of the South Eastern & Chatham section in due course, but, until then, regret that we cannot answer your queries in detail.

[Reply to K. W. B. DAVIES.]

L.M.S. 4-cylinder 4-6-0's.

"Claughton" class are 63 ft. 4¾ in. over buffers, engine and tender, and latest type L. and Y. Horwich 4-cylinder 4-6-0's are 60 ft. 1¾ in. overall.

[Reply to G. C. JONES.]

L.N.E.R. Locomotives.

In the renumbering, N.E. engines remain unaltered, G.N. engines add 3,000; G.C. engines, 5,000; G.E. engine, 7,000; and N.B. engines, 9,000.

[Reply to "HOCKERILL HALT."]

Corringham Light Railway.

For information of the kind you ask, we suggest that you take up with the Secretary and General Manager, Mr. J. H. Freeman, at Coryton.

[Reply to A. CHARRIER.]

G.C. 4-Cylinder 4-6-0 Engines, L.N.E.R.

Of the four-cylinder express passenger engines, "Lord Faringdon" class, on this railway there are six in service, Nos. 6164 to 6169 inclusive.

[Reply to BEN. FIELDING.]

L.N.E.R. (G.C. Section) 4-4-2 Tanks.

These are now employed chiefly on local services round Manchester and Sheffield, and also in the Leicester and Nottingham districts.

[Reply to H. G. FREEMAN.]

"736" Class 4-6-0's, Southern (L.S.W.) Railway.

Driving wheels are 6-ft. 7-in. diameter, and tractive effort, at 85 per cent. working pressure, is 26,250 lb.

(Reply to A. F. W.]

G.W.R. Rolling-Stock.

We have no knowledge as to the purpose of the fitting you specify, but suggest that it was of a special nature.

[Reply to H. G. FREEMAN.]

Metropolitan Railway Electric Locomotives.

These have steel underframes.

[Reply to L. F. B. R.]

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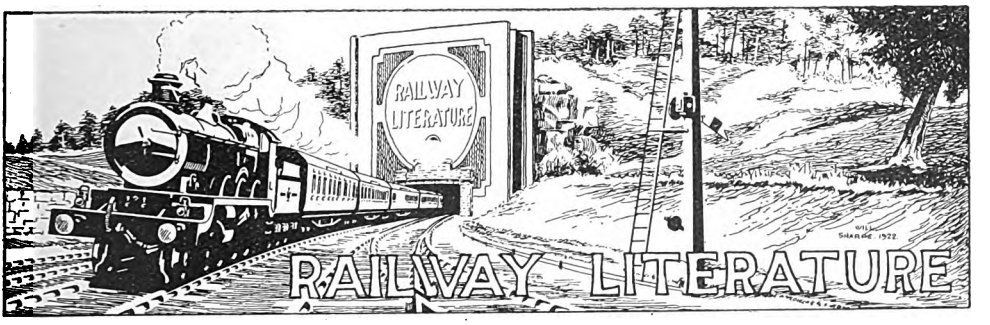

ECONOMICS OF SHIPPING: A STUDY IN APPLIED ECONOMICS. By S. N. Haji, B.A. With a foreword by the Hon. Sir Dinsha Edulji Wacha. [Bombay: Commercial Printing Press. 1924. Price 21s.]

Although this book is concerned with the economics of the shipping industry, there are a number of references to railway practice which may interest our readers. In fact, the author states in his preface that, in the absence of any adequate treatment of the subject of shipping economics, he was obliged to turn to the general theories of railway economics, and to evolve therefrom principles of general application to sea transport.

The main difference between rail and sea transport is, of course, that the ocean is an open highway free to all; consequently the amount of capital engaged is relatively smaller, but as ships, unlike trains, are complete units, and operating expenses cannot be appreciably reduced during times of depression, the financial results are more hazardous and liable to greater fluctuation. The author is generally in favour of railway-owned ports as likely to provide greater facilities for shipping, and throughout the book he makes many interesting comparisons between shipping and railway transport.

The work is a monument of patient labour and research in what was largely a new field. The various sections deal in detail with the general principles of shipping economics, shipping capital, the chartering business, and the freight market, shipping expenditure, conferences, shipping income, rates and passenger traffic, ports, State-aid to shipping, and the Indian mercantile marine. Although his book is mostly of general application, the author is of course especially interested in the last-named subject, which has now obtained considerable prominence in India in view of the recent report of the Indian Mercantile Marine Committee and the draft Merchant Marine Bill which will now be submitted to the Assembly, with the object of developing a native Indian mercantile marine. The author is the manager of the Scindia Steam Navigation Co. Ltd., of Rangoon, and was formerly Professor of Economics at St. Xavier's College, Bombay. The book is clearly printed, and furnished with diagrams and extensive bibliography and a copious index, but we have not found the latter always reliable in looking up references in the text.

GREAT WESTERN PORTS.—This sumptuously got-up handbook for 1925 is produced and published by H. N. Appleby by arrangement with the Great Western Railway Company, and is issued from the Chief Docks Manager's Office, Cardiff. It consists of 273 pages plus a large and exceedingly attractive advertisement section, and is furnished with a stout cover of artistic design containing on its front page a typical and tinted illustration. Art paper is employed throughout, and as the letterpress of each page is enclosed within a pictorial border and only the clearest type is used, the result is exceedingly effective. The handbook is divided into sections, as Cardiff, Swansea, Newport, &c., and a tinted plan of the docks at each port is provided for each section. In addition, full-page illustrations in half-tone are given, and there is, besides, a fine large folding map, in colours, of the Great Western Railway Company's system. Portraits of Viscount Churchill, Chairman, G.W.R. Company, Sir Felix J. C. Pole, General Manager, and Mr. E. Lowther, Chief Docks Manager, are also given. The handbook measures 8¼ in. by 10¾ in. by 1 in. thick. Previous issues of the handbook bore the title "South Wales Ports," which has now been changed in view of the inclusion of, and extended reference to, other ports of the company. Applications for copies—which will be sent gratuitously and post free to business houses—should be made to the Chief Docks Manager, Great Western Railway, Cardiff.

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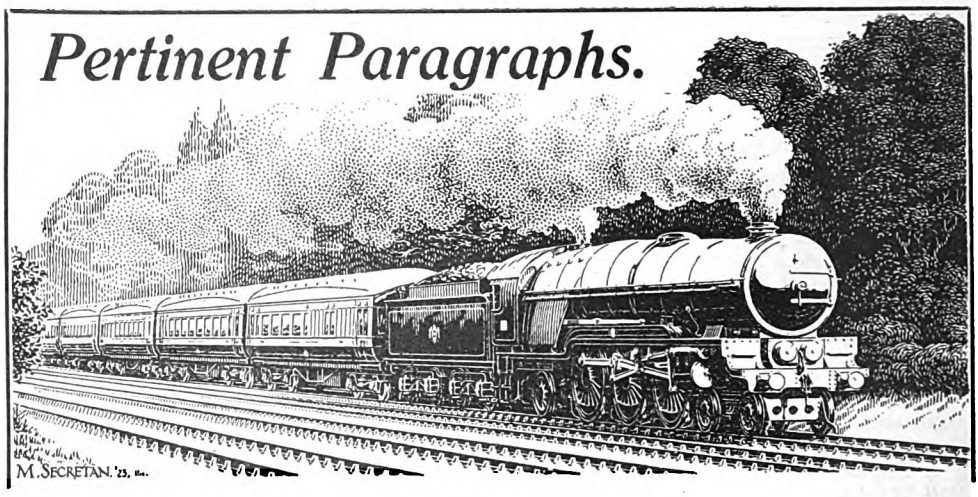
Pertinent Paragraphs.



Rebuilt 4-6-0 Locomotive, G.W.R.

By courtesy of Mr. C. B. Collett, O.B.E., Chief Mechanical Engineer, Great Western Railway, we are enabled to illustrate, as frontispiece, 4-6-0 locomotive No. 2925, *Saint Martin*, reconstructed as a mixed traffic engine, with 6-ft. instead of 6-ft. 8½-in. coupled wheels, thus increasing the tractive effort from 24,395 lb. to 27,275 lb. The engine still carries a No. 1 standard boiler, but the cab has been remodelled on the lines of the "Castle" class, and modifications made to the brake and reversing gears. Leading dimensions are given on the plate.

Great Western Railway Meeting.

Viscount Churchill's address to the shareholders at the recent annual general meeting of the Great Western Railway Company was notable because of the amount of "straight talking" which it contained. Thus, he pointed out that if reductions in working expenses cannot be effected, there will be no alternative for the companies but to consider an increase of rates. "In this connection our experience is that the price of certain commodities has recently advanced. One item alone is of interest: the increase in the price of coal last year compared with the year 1923 represented an addition to our expenditure of £106,000." Again, after mentioning that the total G.W.R. payments for local rates were, last year, about £1,570,000, and that the actual cost of upkeep and maintenance of roads is now about £45,000,000 per annum, he emphasised the fact that heavy commercial vehicles contributed only about £4,500,000 to that expense. Yet these vehicles are strong competitors of the G.W.R., and he suggested that that was a form of subsidised competition. Indeed, he thought that the time had come when the public should insist on the Government making the heavy users of the roads pay a proper share of the cost of their upkeep, and the railways and other taxpayers relieved accordingly. The position was, indeed, he claimed, distinctly unfair. Their competitors were provided virtually with a free road and free signalling "in the form of policemen," whereas the G.W.R. spent upwards of £4,000,000 on the upkeep and maintenance of its permanent way. As to branch lines, Lord Churchill suggested that as many branch lines do not pay, the time might come when they would have to be closed, and places on them served by road vehicles operating from the nearest trunk-line station.

L.M.S.R. Meeting.

In his address to the shareholders at the London Midland and Scottish Railway meeting, Sir Guy Granet perfectly frankly, but in a fashion entirely removed from the provocative, put before the shareholders what would be the practical effect of granting the new all-grades' programme of the N.U.R. and Railway Clerks' Association. On a very conservative calculation the concession would amount to an additional £17,250,000 a year. This would wipe out not only the dividend of 7 per cent. on the ordinary stock, which requires £6,664,171, and the dividends on the guaranteed and preference stocks, which take £8,091,926, but would also cause a default of £2,500,000 in interest on the 4 per cent. debenture stock. The programme excludes the possibility of economies at the expense of the wages staff and the lower-grade salaried men. But, even if the salaries of directors, officers, and all the other staff to whom the programme does not apply (*i.e.*, those receiving £400 a year and upwards) were totally eliminated, there would still be a shortage of £1,000,000 on

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the debenture stock interest. An interesting explanation of the effect of the Wembley traffic was given by the chairman. Though goods tonnage on the whole fell off, both ton-mileage and goods train-mileage increased. In order to serve the heavy Wembley traffic from the North and Midlands, goods trains had to be diverted to longer and less easily operated routes, involving greater length of haul and heavier coal expenditure.

Southern Railway Meeting.

A CONSIDERABLE part of the chairman's address was devoted to the traffic difficulties of the railway and the comprehensive steps being taken to overcome them. Many of these have already been described by Sir Herbert Walker, but some interesting further details were added. The two new Channel steamers for the Dover and Folkestone routes, one of which is expected to be ready by July 1, will provide complete shelter from the weather on the main deck for nearly 300 passengers, and will cost approximately £200,000 each. Large sheds built of steel and concrete, and fitted with the latest type of vacuum suction plant, will shortly be completed at Orpington, Addiscombe Road and Slades Green, which will enable a line of carriages over 2 miles long to be simultaneously cleaned. Passenger traffic last year was over 26 per cent. above that for 1913, the largest increase within the last 10 years on a main line. More people were carried to and from seaside resorts than ever before, and the Continental traffic went up from 1,650,000 passengers in 1923 to 1,850,000 in 1924. Goods traffic also increased by 625,000 tons, the increase being under every head, which is particularly gratifying in a year of such bad trade. The partial enginemen's strike in 1924 cost the company £150,000 in passenger earnings.

L.N.E.R. Meeting.

IN the course of his address to the shareholders of the London & North Eastern Railway at the second annual meeting, the Chairman, Mr. William Whitelaw, again explained the policy of the Board in appropriating such a large sum from Railway compensation reserve in order to maintain the 2½ per cent. dividend upon the deferred stock. Total net income for 1924, as the chairman pointed out, shows a decrease of £2,329,554, a sum almost the same as the amount lost during the year by the reduction of goods and mineral rates. Therein lies complete justification for maintaining the dividend out of the compensation fund which the company received under the Railways Act of 1921 for the very purpose, among others, of helping by the reduction of rates the re-establishment of the nation's trade. Moreover, the rate of dividend which is being paid out of the compensation fund is below the minimum to which the company is entitled on the basis of standard revenue. Mr. Whitelaw showed that it would be comparatively easy to close down the capital account, to stop expenditure on arrears and improvements, and to curtail travelling facilities, but such a policy would be to the ultimate disadvantage of the company, and it has been passed in review only to be rejected. Dealing briefly with the new demands put forward by the N.U.R. and R.C.A., the chairman pointed out that if granted they would cost the company over £13,000,000—£9,000,000 due to the direct increases in wages and £4,000,000 in altered conditions of service—thus wiping out all dividends and all interest on debenture stocks.

The "Met.'s" Achievements.

NOT without reason, Lord Aberconway was in a very cheerful mood when he faced the proprietors of the Metropolitan Railway Company at the annual general meeting in February. His story was one of achievement — something attempted, something done. The accounts were of an eminently satisfactory character, with nothing but good solid stuff behind them, as his lordship was at pains to point out. Not for forty years had the company so good a dividend or such accounts—3 per cent. for the half-year, making with the 2 per cent. paid as an interim dividend, 5 per cent. for the year: an increase of 1 per cent. on the 1923 dividends with an increase in the appropriation to the general reserve of £10,000, and an increase in the carry forward of £15,000. As Lord Aberconway explained, an even higher dividend might have been paid, but after giving the matter most careful consideration his colleagues and himself came to the conclusion that it would be better to use a substantial part of the extra revenue brought to the company by the Wembley Exhibition traffic for the purpose of strengthening the company's financial position through its various accounts. Many important extensions and improvements are indicated in the report, including the extensive works now proceeding north of Harrow station, the re-signalling of the line to Rickmansworth, and the electrification of the line from Harrow to Rickmansworth, considerable sums having been spent on rebuilding and enlarging various stations. Twenty main-line coaches have been added to the rolling-stock in readiness for next autumn's Watford service; whilst the whole of the company's electric locomotives have been rebuilt in order to increase their hauling capacity.

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"Underground's" Finance and Extensions.

LORD ASHFIELD, at the recent combined meeting of the five Common Fund companies of the Underground Group, gave a valuable summary of their financial position. These undertakings carried more passengers in 1924 than in any previous year, but the whole increase in traffic was in the omnibuses, and, in addition, over 7 million further passengers gained by the omnibuses were lost to the railways. What has been lost by the railways, however, has not enabled any reduction in train service to be effected, or any other economies to be made, and what the omnibuses have gained has been more than offset by the expenses of working a larger fleet. Hence the Common Fund in 1924 was £182,258 less than in 1923. While traffic receipts increased by 5 per cent., the work performed to carry the traffic increased by 11 per cent. Between January 1, 1919, and December 31, 1924, this group of companies has spent on extensions and improvements £15,600,000, and is committed to a further expenditure of £5,350,000 to complete works already begun. Until this expenditure becomes self-supporting, by attracting additional traffic to the system as a whole, fresh schemes of expenditure cannot reasonably be undertaken. If London hopes to secure new tube railways in the south-east and north-east and other new traffic facilities, it can only be as part of a co-ordinated scheme in which each means of transport takes only its proper share, and in which the present unchecked and destructive competition is brought within proper limits.

L.M.S. Insurance, Provident and Pension Societies.

THE L.M.S. have already played a considerable part in the solution of the housing problem of their employees by the scheme for loaning 90 per cent. of the cost of a house at 4 per cent. interest, and £1,000,000 has been allocated by the company for this purpose. The annual meeting of the Insurance and Provident and Pension Societies of the L.M.S. (L. & N.W.) revealed another successful activity of the company on behalf of its workers. The balance in hand is £794,327, and £37,575 were paid out in sickness benefits during the past year. Retiring gratuities show a considerable drop, owing to the welcome policy of the company in extending the retiring age from 65 years to 70 years when a worker is fit. A valuable addition to the society's funds is the amount received in interest, which amounts to £30,179 for the year, a state of affairs unequalled by any other body of employers. Mr. Cecil Graseman, for 23 years Secretary of the Insurance and Provident and Pensions Societies, to whose energetic and sympathetic work much of the success is due, retires this year owing to his increased responsibilities at Euston. Mr. A. W. Willcox, the Assistant Secretary, has been appointed to succeed Mr. Graseman.

Railway Rates and Cost of Living.

FROM time to time the newspaper press, in its references to the cost of living, contains statements implying that increases or fluctuations in the prices of foodstuffs are largely attributable to the "crushing burden of excessive railway rates." Well-worn phrases of this character have lately again made their appearance in connection with the sittings of the Royal Commission on Food Prices. Especially opportune, therefore, is the appearance of an attractive and trenchant little pamphlet issued by the Railway Clearing House, being an up-to-date version of their "Railway Rates: How they Affect the Cost of Living." It is greatly to be hoped that the facts contained in this pamphlet will gain as wide publicity as the loose statements which have circulated in the lay press. It is addressed primarily to the housewife, and proves conclusively, by a large number of examples, that railway rates are in no way responsible for the fluctuations between wholesale and retail prices during recent months. Moreover, it brings out the striking fact that the proportion of prices of foodstuffs attributable to railway carriage is actually less in 1924 than it was in 1913!

Direct Motion for Locomotives.

COMMENTING upon a reply published in the December RAILWAY MAGAZINE, Mr. Kenneth Arnott sends some informative remarks which clear up some of the points which may not be easily understandable on the basis of a necessarily very brief reply in "The Why and Wherefore" section. These remarks apply to the "Prince of Wales" class locomotives on the L.N.W. section of the L.M.S.R. In regard thereto Mr. Arnott writes as follows: "Both the 'Direct' and 'Indirect' engines have Joy's motion, but in the former instance, known as 'class 8,' the valve rod from the lifting links is coupled up direct to the valve spindle crosshead, while in the class 8A, or 'Indirect' engines, the valve rod drives the valve spindle through a small rocking shaft. This rocking shaft was provided on the earlier superheater engines to give the reverse travel required for inside admission valves. More recently, however, the 'Direct motion' came in again, mainly on account of its strength. With its introduction, the two top pins in the lifting links, used for pivoting the valve rod and slipper blocks,

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were changed over to give correct lead to the valve, as the reversing shaft quadrant guides had to slope the opposite way to those in the 'Indirect' engines.

"Also, in this connection, it is interesting to note that in order to prevent any drivers being confused with the two classes, all the class 8 engines have a left-handed screw cut in the reversing wheel shaft. Thus, in both cases, the wheel is turned to the right for forward gear. All the 'George the Fifth' class engines and rebuilt 'Precursors' have indirect motion, while none of the superheater 4-6-2 tank engines have, or ever had, anything but Direct motion."

Several other readers have also written in regard to this matter.

Closing of the Dublin and Lucan Railway.

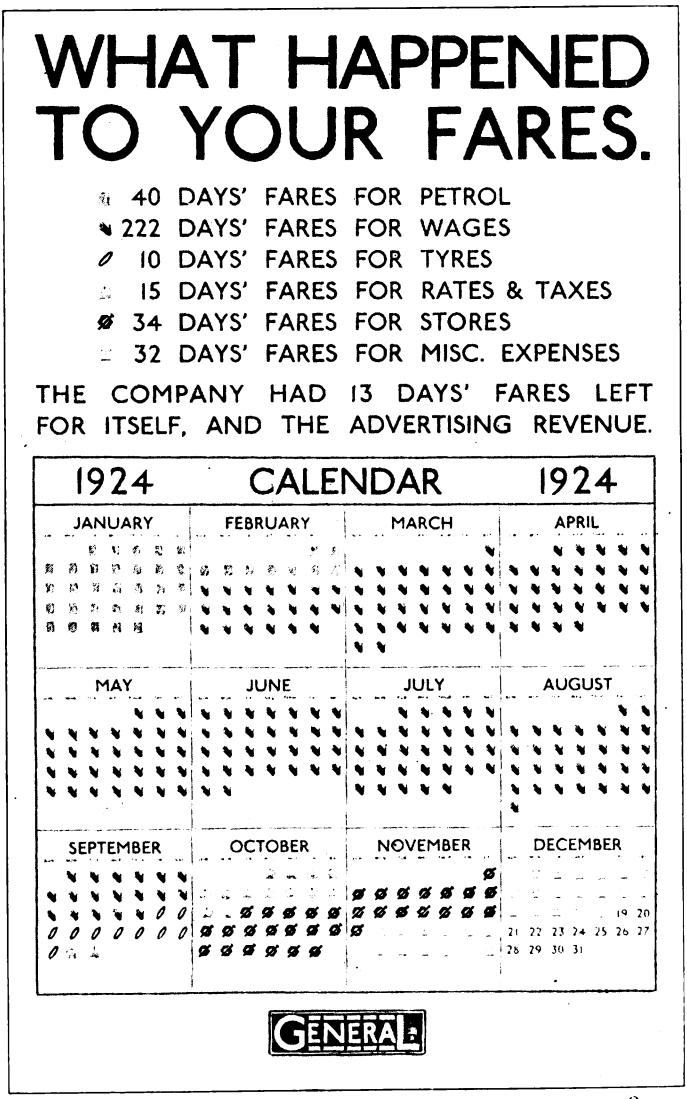
ANOTHER of the smaller and unusual railway systems of the Irish Free State, according to a Dublin paper, has suspended business for financial reasons, the Dublin and Lucan Railway having ceased traffic recently. The line is 7½ miles long and runs up the Liffey Valley to Lucan. It is laid on a slight embankment alongside the highway, and was opened in 1882 as a steam tramway, the gauge being 3 ft. In 1897 it was converted to electric traction and the gauge altered to 3 ft. 6 in., being the only railway of that gauge in the Free State. At the time there was criticism that the alteration of the gauge should have been to 5 ft. 3 in., to enable the line to be worked in conjunction with the Dublin United Tramways Company. There was a speed limit of 10 m.p.h. over the whole line.

The company had its own generating station and supplied current for lighting in the neighbourhood of its power station. The line was under Government control during the war. A separate company opened an extension from Lucan to Leixlip, 1⅞ miles long, in 1889, but this was closed in 1898 and the rails taken up.

An "Economic" Calendar.

A NEW and striking "Underground" poster has been issued. It takes the form of a calendar, and by the substitution of symbols for the customary figures, the travelling public are shown what becomes of the fares they pay in the course of a year.

Thus the cost of a year's petrol, illustrated by one of the familiar tins, accounts for 40 days' receipts; wages, the symbol for which is a hand, absorbs the traffic receipts for 222 days; tyres, rates and taxes, stores, and miscellaneous expenses total 91 days, and, when all outgoings are taken into consideration, only 13 days' fares are left out of the 365.



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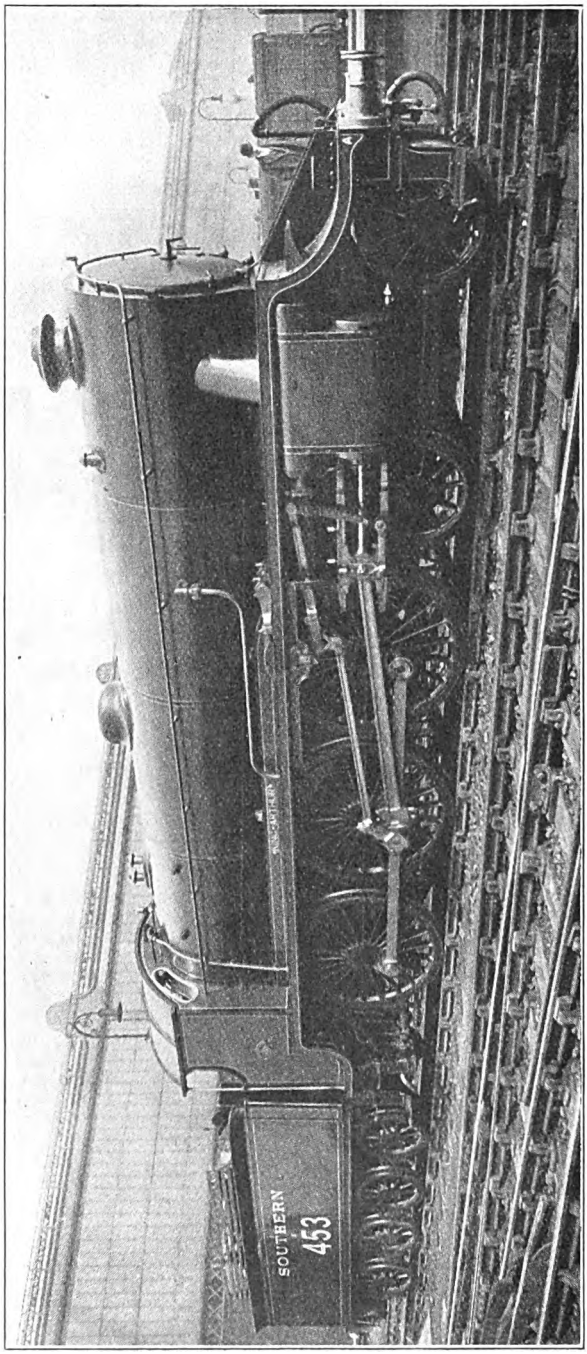

Photo.] **REBUILT 4-6-0 LOCOMOTIVE No. 453E, "KING ARTHUR," SOUTHERN RAILWAY.** [*Topical.*

This engine was originally one of the late Mr. Dugald Drummond's four-cylinder main line locomotives. It has now **been rebuilt as a** modern two-cylinder 4-6-0 engine, and is further of interest in that it initiates the policy of naming **locomotives on the** L. & S.W. section. As explained on the opposite page, the first series of named engines take names **connected with the** legend of King Arthur and the "Knights of the Round Table." No. 453 becoming "King Arthur."

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Locomotive Development in Ireland.

MR. H. W. LEA, writing from Dublin, sends some further remarks as to traffic and locomotive development in Ireland, particularly changes arising out of grouping, as follows :—

"Since writing last, M.G.W. 0-6-0 tank engine *Cong* and G.S. & W. 0-4-4 tank No. 73 have been transferred to the D.S.E. section, and are working on the Westland Row–Bray section. M.G.W. 2-4-0 tender locomotive No. 34, *Aurora*, has been working between Bray and Harcourt Street, while G.S. & W. express 4-4-0 locomotive No. 60 has been working regularly out of Westland Row on the 9.45 a.m. for Bray, &c. No. 63 of the same class has also been on the Westland Row–Bray section, and M.G.W. 0-6-0 goods engine *Ajax* was observed outside Westland Row recently.

"The Great Southern have also put into use, as from the 22nd February, a new five-coach pier train for service between Westland Row and Kingstown Pier. This train consists of one brake van (21 tons), one third-class coach (22 tons), two composite (1st and 3rd) coaches (27¼ tons each), and a brake composite (28 tons), all bogie stock recently renovated specially at Inchicore for this service.

"This train is a distinct credit to the company, its smooth running being in marked contrast to the old D.S.E. bogie stock, while the coaches are very well upholstered, some of the third-class compartments in the composite coaches being converted "seconds" and comparing favourably with even Midland of England 'thirds.'

"The Great Southern have also effected a number of improvements and accelerations in their train service, as from March 2, chiefly on the Kingsbridge–Cork section, where the up and down mails, as well as trains such as the 9.30 a.m. and 4.55 p.m. (now 5 p.m.) from Kingsbridge, have been considerably accelerated, though still falling somewhat short of pre-war level. Beyond a connection off the 2.30 p.m. ex Broadstone for Limerick and Ennis *via* Athenry, the M.G.W. section remains practically unaltered, and it is to be hoped that some much-needed and quite feasible accelerations will be made shortly on this section. Mr. Mortin's fine 4-4-0s of the 'Mercuric' and 'Kylemore' classes are somewhat wasted on the present easy standard booking of 75 minutes between Broadstone and Mullingar (50½ miles). A 65-minute booking is easily within the power of the engines for this section, especially from Mullingar to Dublin, and I have personal recollections of the Dublin–Mullingar run being done well under this time by the larger wheeled 2-4-0s in or about the years 1902-3, when a tourist express was actually booked to Mullingar in 67 minutes."

Southern Railway Locomotives to be Named.

HITHERTO, only in the case of the London, Brighton & South Coast section has it been the practice to name locomotives, but the announcement is now made that many of the new engines now under construction for Southern Railway services are to bear names. The first series is to be named after the Knights of the Round Table, in view of the traffic facilities which the Southern Railway provides for North Cornwall and the district with which King Arthur was associated. Thus, there is King Arthur's Castle on Tintagel Cliffs, the town of Camelford (the Camelot of King Arthur's Legends), and Slaughter Bridge, where King Arthur is supposed to have fought his last battle. There will be 44 engines named after Knights of the Round Table. The name-plates will be in brass, with raised and polished letters on a dark green background.

A list of the names which are to be given by the Southern Railway to the sixty "King Arthur" class of locomotives has been issued as follows :—

King Arthur, Excalibur, Queen Guinevere, Sir Launcelot, Sir Galahad, King Uther, King Pellinore, King Leodegrance, Merlin, Joyous Gard, Camelot, Lyonnesse, Sir Bedivere, Sir Tristram, Sir Tor, Sir Kay, Sir Llamorak, Sir Meliagrance, Sir Bors de Ganis, Sir Gawain, Sir Gareth, Sir Geraint, Sir Modred, Sir Balin, Sir Balan, Sir Prianius, Sir Sagramore, Sir Percivale, Sir Lavaine, Sir Gaheris, Sir Agravaine, Sir Galagars, Sir Lamiel, Sir Pelleas, Sir Colgrevance, Sir Persant, Sir Aglovale, Sir Brian, Sir Gillemere, Sir Nerovens, Sir Mador de la Porte, Sir Lionel, Sir Menadeuke, Sir Beaumains, Sir Guy, Sir Villiars, Sir Uwaine, Sir Hervais de Revel, Maid of Astolat, Tintagel, Pendragon, Elaine, Vivien, Iseult, Morgan le Fay, Etarre, Linette, Melisande, The Green Knight and The Red Knight.

Other classes of new engines will be named as they are delivered, and it has also been decided to name some of the popular coast expresses on the Southern Railway.

Conveyance of Poultry.

AN experiment recently made by the London Midland and Scottish Railway Company for the better and more humane conveyance of poultry by train did not have the effect anticipated, and resulted in a prosecution at the St. Albans Police Court. The company was charged with cruelty to poultry by overcrowding. It was stated that the birds were sent from Elgin to St. Albans, *via* London, in three open trucks covered with wire, the journey occupying 70 hours. Some 200 birds were put into one truck. On arrival at St. Albans 59

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birds in the three truck-loads were found to be dead and some were lacerated as the result of their struggles. The company pleaded guilty, but denied wilful neglect, pointing out that the sending of the poultry in open trucks, instead of crates, as usual, was an experiment made on humanitarian grounds. The experiment had admittedly failed, and it would never occur again. From the smallness of the fine imposed (£5, with £5 5s. costs) it is clear that the company was not regarded as wilfully neglectful in the matter. On the face of it, travelling in an open truck instead of in the close confinement of a crate would seem to be more comfortable in every way for poultry. But this experiment would seem to show that, once they get frightened and cross, the more room there is for them to fight one another and the worse it is.

Sir Bradford Leslie at the Permanent Way Institution.

At a recent meeting of the London Section of the Permanent Way Institution the special feature was that Sir Bradford Leslie, although in his ninety-fourth year not only gave a lengthy and highly technical paper, but also read it straight through in a clear, distinct voice and at a round pace, without the slightest sign of fatigue, in itself a considerable physical achievement for a man of his years. But it is obvious that Sir Bradford is mentally as well as physically alert. The proposals and statements in his paper were of a highly controversial nature, and he faced a critical audience and followed a lengthy discussion with every sign of attention to the end. Another noteworthy circumstance was the fullness of the discussion and the standing of those who took part in it, in view, moreover, of the fact that this was but a sectional meeting; and, finally, a fact to which the President and others called attention with justifiable satisfaction: this was the first time that a sectional gathering of the Permanent Way Institution had met in the lecture theatre of the Institution of Civil Engineers, and yet the attendance compared not unfavourably with some of the ordinary meetings of the premier Institution itself.

L.M.S. Sporting Posters.

As a sequel to their Royal Academicians' series of advertising posters, illustrating beauty spots on their system, the London Midland and Scottish Railway are about to publish a series of sporting pictures illustrative of the many different sports and pastimes that are to be enjoyed within the area covered by the railway. The artist commissioned for this work is Mr. Norman Wilkinson, R.I., whose posters of the Holyhead route to Ireland have been popular favourites for many years. Mr. Wilkinson is also well known to a smaller public for his skill in paintings of sporting subjects, on which work he spends several months of each year. Discussing his task recently, Mr. Wilkinson explained that this was the first entry by a railway company into the realm of sport as subject for advertising. "In the territory of the L.M.S. system," he said, "one finds every possible form of sport—salmon and trout fishing, shooting, hunting, yachting, racing, deer stalking, and, of course, the best of golf. Few people realise also that in Scotland there is plenty of good skiing, or know that many experienced climbers prefer the mountains of Wales and the English Lake District to the snowfields of the Alps." Mr. Wilkinson has already completed several paintings for the new series. They are now being reproduced in colour, and will be on the hoardings very soon.

Locomotive Development.

On Friday, February 13, Mr. Loughnan Pendred, Editor of *The Engineer*, gave before the Junior Institution of Engineers an interesting lecture on "Milestones in the Development of the Prime Mover Locomotive." The lecture was illustrated by an interesting series of lantern slides.

Mr. Pendred said he refused to regard the electric locomotive as a locomotive at all, because it derived its power from a distant source. A locomotive was essentially a self-contained machine. Contrary to general supposition, George Stephenson was not the "father" of the locomotive. Richard Trevithick's engine of 1803 might be regarded as the beginning of the locomotive. We owed also to Trevithick the use of high-pressure steam, and to Stephenson the introduction of springs. Not until 1825 was there any real development of what one might call a type, and until then vertical cylinders were generally to be seen. Hackworth's *Royal George* began the second "milestone," with efforts to secure expansive working, and, later, came the *Lancashire Witch*, with cylinders at 45 deg.

1829 was really the starting-point of locomotive history, when the success of the *Rocket* at the Rainhill trials demonstrated that the locomotive was really practicable. Mention also was made of the *Northumbrian* engine with horizontal cylinders, and the *Planet*—a much larger engine—which indicated that a definite locomotive design was being followed. Developments since 1839 had been in the nature of improving the fuel consumption by the greater use of expansive working. After illustrating the evolution of the link motion, Mr. Pendred said it was not

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realised that Walschaerts patented his valve gear as early as 1844.

From 1850 there had been no remarkable change in the steam locomotive, except in the wheel arrangement. Various engines typical of this change were illustrated, ranging from the famous "Bloomer" singles of 1851 to the 4-6-0 and 4-6-2 locomotives and 4-6-4 tank engines of recent years. Brief reference was made to the special types recently appearing on the scene, such as the Ramsay turbo-electric locomotive, the Reid-McLeod, Ljungström, and Zoelly turbine locomotives, and Diesel-electric engines.

Mr. Pendred thought that the days of the reciprocating locomotive were numbered, although a considerable time would elapse before it was completely superseded. He pleaded the cause of the self-contained locomotive; one that was not dependent on a central source of power, whose threatened stoppage could be used as a weapon for political or other reasons. Dr. Alexander Russell, President (in the chair), and Messrs. Tennant, Ackermann, Poultney, Marshall and Tookey contributed to the subsequent discussion.

The Haymarket Collision.

Colonel Sir J. W. Pringle's report on the fatal collision on July 28, at Haymarket station, Edinburgh, has been issued. The 6.41 p.m. Inner Circle suburban passenger train (ex Leith Central) was standing on the down South platform when the following passenger train, the 6.54 p.m. from Waverley to Kirkliston (Port Edgar), struck it. The speed of the second train at the moment of collision does not appear to have been greater than 10 miles an hour. But, unfortunately, owing to the second coach from the rear of the suburban train mounting the frame of the vehicle in front, several compartments of the latter were crushed together, with very serious results. Five passengers were killed and 54 injured; of the latter, 12 suffered from fractures, and the remainder from minor injury or shock effect. The suburban train was drawn by 4-4-2 tank engine No. 133. The weight of the coaching stock was 104 tons; total length of the train with engine, 328 ft. 5 in. The Port Edgar train was worked by 4-4-0 tender engine No. 9338, running tender first. The total weight of the coaching vehicles was 102 tons 2 cwts.

The chief point at issue, and upon this there was direct conflict of evidence, was as to the position of the down South starting signal for Princes Street Gardens when the Port Edgar train passed it. Colonel Sir J. W. Pringle argues, however, after fully considering evidence on all points—

(*a*) That the suburban train was not cleared back to Princes Street Gardens by normal bell signal.

(*b*) That the Port Edgar train was not offered forward to Haymarket East and was never accepted.

(*c*) That it was normally impossible for signalman Duncan to lower the starting signal at Princes Street Gardens for the Port Edgar train unless the electrical lock on that signal lever had been released by signalman Lauder at Haymarket East by plunging on the relative instrument, and thereby allowing an electric current to pass and do its work of release.

(*d*) That until the suburban train had left the platform, and had actuated the treadle (C) in advance of the down South home signal at Haymarket East, the plunger in Lauder's instrument was locked, and could not be utilised to free the electrical lock on the down South starting signal at Princes Street Gardens.

(*e*) That the lock and block treadles (A) and (B) in connection with the down South signals at Princes Street Gardens were tested after the accident, and the apparatus throughout found to be in working order, including the reversing effect of treadle (A) upon the down home signal.

Was the Signal Clear?

He admits, however, that the driver of the Port Edgar train was most emphatic in his assertion that the starting signal was "clear" when he approached and passed it, giving his evidence in a clear and impressive manner, and not being shaken by cross-examination, though the evidence of his fireman in support was, in the inspecting officer's opinion, less convincing. It is pointed out that if their evidence was correct there must have been irregular working on the part of the signalman, or serious failure of lock and block electrical or mechanical details. After very full consideration of various possibilities in this connection, Sir J. W. Pringle says that he has been forced to the conclusion that driver Swan was mistaken.

The evidence established the fact that the down North starting signal was in the "off" position for an empty carriage train, whilst the Port Edgar train was approaching the starting signal on the down South line. Both signal posts are carried on a bridge over the northern pair of lines. There is also the possibility that the up South home signal for Princes Street Gardens was lowered at the same time. Driver Swan's engine was travelling tender first, and his normal position on the left of the footplate was reversed. "I can only conclude that he misread the signals on this occasion, and that the signal for the down South

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line was at danger when he passed into the tunnel. It is true that in this case the warning bell, operated by an electrical contact bar immediately in advance of the starting signal, should have sounded, and no doubt did sound. But the impression I obtained when testing the bell was that the sound could not be relied upon to reach the ears of the driver of a passing train, especially if he were on the right-hand side of the footplate. Swan was sure that he did not hear any bell ring as he entered the tunnel, and doubted whether he would have heard it even if it had been ringing."

Misreading Signals.

THE principal conclusion is, therefore, that the starting signal for the down South line was in the danger position when driver Swan passed it, and that responsibility for the collision rests mainly upon him for misreading signals. Having regard to the condition of the atmosphere at the mouth of Haymarket Tunnel, it is suggested that the driver can hardly be blamed for not avoiding the collision after emerging from the tunnel mouth. The action of signalman Duncan in not bringing the Port Edgar train quite or nearly to a stand before lowering the home signal was to some extent a contributory cause. Had he done so there would have been less liability on the part of driver Swan to misread signals. The report concludes with suggestions that, as a means of warning enginemen that they are passing signals in the danger position, a treadle bell arrangement, such as exists at the east end of Haymarket Tunnel, cannot, in the inspecting officer's opinion, be relied upon. He suggests that, in default of automatic train control, the use of detonator placer machines, working in conjunction with the down South and North starting signals, appears to be an advisable precaution at Princes Street Gardens. Fault is also found with the action of the station master at Haymarket, in delaying the suburban train to allow passengers from an up express to join it, this being contrary to the instructions of the Traffic Superintendent. A feature of the accident is the fact that, owing to the Edinburgh, Glasgow, Fife district and Aberdeen holidays, the suburban train was made up of old stock, the usual bogie stock having been withdrawn for main line duties. But for this the result of the accident might have been much less serious. It is pointed out that although none of the vans in the trains concerned contained the usual salvage tools and ambulance equipment, the arrangements made by the company for dealing with the passengers in the wrecked compartments, and for obtaining medical, &c., assistance, appear to have been adequate, and the rescue work to have been carried out expeditiously.

A Fatal Light Engine Collision.

AT about 7.10 p.m. on November 20 last a head-on collision occurred at Whitehouse North Junction, near Preston, L.M.S.R. The 7.8 passenger train (Preston to Ormskirk) was approaching Whitehouse North Junction on the up line with all signals set for the movement when it collided with a light engine. The latter had run round the Whitehouse triangular junction with the object of turning, and was travelling back to Preston in a facing direction on the same line. Nine passengers suffered from shock effect and slight injuries. One engine driver was killed, and the second fatally injured. The two firemen and the guard of the passenger train were also injured. The passenger train was drawn by 2-4-2 tank engine No. 10676, which was running chimney first. The light engine was a 4-6-0, No. 1512. The latter had worked the 5.50 p.m. express passenger train from Liverpool (Exchange station) to Preston, where it is due to arrive at 6.40 p.m., and was subsequently booked to take a set of empty coaches from Preston to Lostock Hall carriage sidings, and to return thence light to Preston station to work the 9.47 p.m. passenger train to Liverpool. In accordance with practice, the engine, being of large size, was sent for turning purposes round the Whitehouse triangle *via* the North, West and South Junctions to return to Preston.

There was contradiction of evidence in regard to whether the light engine was clear of the crossover points in question, and Colonel Sir J. W. Pringle points out that, while it is difficult to do otherwise than credit the fireman's evidence that the engine was well clear of the points, it is equally difficult to discredit the signalman's story, though obviously both could not be correct, as, otherwise, when the engine set back it would have moved over the crossover on to the down line instead of running in the facing direction on the straight up road. After discussing various aspects, the inspector states that he is unable to offer a positive opinion as to whether the initial responsibility for the accident rested with the light enginemen or with the signalman. Certain criticisms of the action of the enginemen are, however, made, though the enginemen of the passenger train are entirely exonerated.

Movements without Fixed Signals.

WITH regard to the signalman concerned, it is suggested that he should

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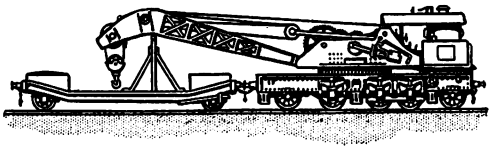
have delayed his telephone work until he had observed the engine passing his box. Had he not been otherwise engaged he might have taken other safeguarding action, while observation of the indicator for the down line track circuit would have told him that the engine was not travelling on the down line. A degree of responsibility is, therefore, attributed to the signalman, though the suggestion is made that had fixed signals been provided at this point to control the crossover this particular accident would in all probability have been prevented.

Colonel Sir J. W. Pringle remarks in this connection that the necessity for the provision of fixed signals at a crossover road depends upon the character of the user and its position. Broadly speaking, the view of the inspecting officers has been that at connections of this sort, when they are required for use solely in any emergency such as single line working in the case of an accident, or in connection with ballast and relaying work, fixed signals are not necessary, more especially if the crossover is directly in front of a signal box. But it was clearly established in the evidence that, by reason of the inability of enginemen to turn engines of large size on the turntable at the east end of Preston, and to avoid traffic delays which would be occasioned by sending such engines through Preston station to turn on the table at the west end, these engines habitually run round the Whitehouse triangle.

With regard to engine movements over the Whitehouse triangle, it is pointed out that there are five cases only on ordinary weekdays and six on Saturdays which involve the use of the crossover at Whitehouse West. At that point, however, fixed signals are provided, and there are only two or three cases where the engines have to return to Preston and therefore use the crossover at Whitehouse South. The inspector remarks, however, that since the normal daily use of this crossover by large engines is rendered necessary by existing conditions in Preston station yard, he thinks that fixed signals for the crossover road should be provided, more especially so because the connection is not positioned immediately in front of the signal box. The report concludes by calling the attention of railway companies generally to the desirability for examination of their arrangements for turning engines in circumstances similar to those reported upon, with a view to deciding whether in respect of fixed signalling or in other directions there is need for additional protective measures.

Pennsylvania Railroad Calendar.

We have received from the Pennsylvania Railroad, U.S.A., a striking wall calendar headed by a colour view of the "Broadway Limited" express, which runs between New York and Chicago in 20 hours. In sending the calendar, the Pennsylvania Railroad explain that they recently deputed Mr. Harold M. Brett, a leading American artist, to prepare the illustration, and he selected as a location a view showing the "Broadway Limited" crossing the Rockville bridge. Associated with the picture is the slogan "Speed and Security." The Rockville bridge crosses the Susquehanna River, near Harrisburg, and is claimed to be the longest stone arch bridge in the world. It is four-fifths of a mile in length and carries four tracks. It includes forty-eight symmetrical arches, each of 70 ft. span. When crossing the bridge beautiful vistas of the river are had north and south.



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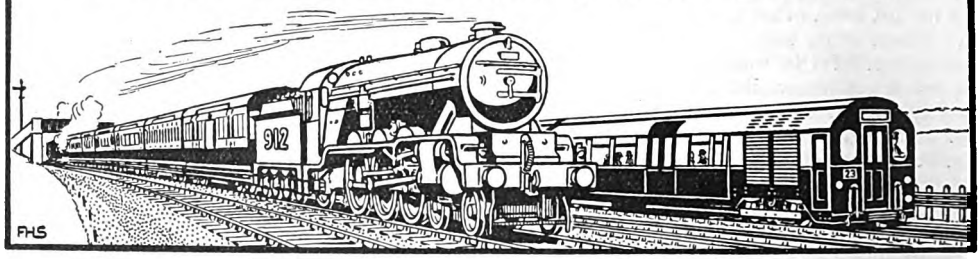
WHAT THE RAILWAYS ARE DOING.



THE Directors of the London Midland and Scottish Railway Company recently approved the following appointments :—

Mr. F. A. C. Leigh, to be Electrical Engineer.

Mr. J. Dalziel to be Assistant Electrical Engineer.

Mr. J. Sayers, to be Telegraph Superintendent.

Mr. L. B. Shoppee, to be Assistant Divisional Superintendent, Euston.

Mr. S. Stoker, to be Assistant Divisional Superintendent, Manchester.

Mr. R. O. Squarey, to be Assistant Divisional Superintendent, Liverpool.

Mr. D. M. Turnbull, to be Assistant, Rules and Regulations Section, Chief General Superintendent's Department, Derby.

Mr. D. O'Hara (Shrewsbury) becomes District Locomotive Superintendent, Patricroft.

Mr. R. T. Clews (Belle Vue) becomes District Locomotive Superintendent, Shrewsbury.

Mr. D. Anderson, Station Master, Bury (Bolton Street), takes charge of Knowsley Street station as well.

Mr. S. R. Sayer, of the D.S.O., Birmingham, becomes Station Master at Lancaster.

Mr. J. C. Brooks becomes Head of Rates Office, Manchester.

Mr. H. Parkinson becomes Chief Rates Clerk, Derby.

Mr. E. F. Chaplin succeeds Mr. Parkinson as Rates Assistant, Derby.

Mr. R. A. Smith is appointed Rates Assistant, Derby.

Mr. J. N. Size becomes Goods Agent, Halifax.

Mr. W. Roberts, of Sowerby Bridge, becomes Goods Agent, Brighouse.

Mr. R. Rosewarne, Goods Agent, Walsall, takes charge of both goods stations at Walsall.

Mr. J. Wade, Goods Agent, Nottingham (Mid.), takes charge of both goods stations at Nottingham.

* * *

MR. W. H. OATES,

Appointed Manager and Secretary, Cheshire Lines Committee.

MR. W. H. OATES, who has been appointed Manager and Secretary of the Cheshire Lines Committee, was educated at the Liverpool Institute, entering Cheshire Lines service in 1881. He remained at Brunswick station, Liverpool, for the first 10½ years, but in 1891 was transferred to the chief office at Liverpool Central station. In 1909 he was appointed Indoor Assistant to the late Mr. Pinion, and in 1911 became Assistant to the late Mr. Charnley, whom he now succeeds. Mr. Oates lays stress upon the practical groundwork of his experience during the period he was employed at Brunswick station, Liverpool, and on the assistance he had from the late Mr. John Macaulay, who became General Manager of the Alexandra (Newport and South Wales) Docks and Railway Company.

* * *

MR. S. A. PARNWELL, who recently retired from the position of Divisional General Manager, Southern Area, London and North Eastern Railway, and who was formerly Land Agent and Rating Surveyor to the

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MR. R. G. DAVIDSON,

Appointed Joint Accountant, Southern Railway.

Great Eastern Railway, is recommencing practice as a Surveyor and Rating Surveyor, and is now associated with the firm of Daniel Watney & Sons, with whom he commenced his career.

* * *

THE directors of the Southern Railway have appointed Messrs. R. G. Davidson and A. Howie as Joint Accountants, *vice* Mr. Chas. A. de Pury, deceased. All communications for the Accountant's Department should in future be addressed :—The Joint Accountants, Southern Railway, Waterloo Station.

* * *

MR. R. G. DAVIDSON, who has been appointed Joint Accountant, Southern Railway, became an Assistant Accountant towards the end of 1923. Mr. Davidson commenced his railway career in the Secretary's Office of the London & South Western Railway, and in due course became a member of the Chartered Institute of Secretaries. In order to widen his experience, he resigned from railway work for the purpose of being articled to a firm of chartered and incorporated accountants, passed all the examinations, and became in due course a qualified Incorporated Accountant. Subsequently he spent the greater part of a year travelling in the United States and Canada, and some years later he revisited America, and in Japan and the Far East was afforded special facilities for the study of the railway systems of those countries. On his first return from the States, Mr. Davidson, after serving for some little time with a firm of chartered accountants, was, in 1909, appointed General Assistant to Mr. F. Hartnell, then Accountant of the London & South Western Railway. He was placed in charge of the alteration and revision of the accounts of all departments of the company necessitated by the Railway Companies (Accounts and Returns) Act, 1911, and in 1914 became one of the original Investigators appointed on behalf of the Government to examine railway companies' accounts during the period of Government control. When Mr. A. E. Newhook was appointed Accountant, L.S.W.R., he became Principal Assistant, which position he held up to his appointment under the Southern Railway above noted.

* * *

MR. A. HOWIE, who has been appointed Joint Accountant, Southern Railway, became an Assistant Accountant towards the end of 1923. Mr. Howie joined the service of the South Eastern & Chatham Railway as junior clerk in the Locomotive Accountant's Office in 1890. He was subsequently transferred to the Chief Accountant's Office, London Bridge, where he became eventually Chief Clerk, and in 1921 was appointed Assistant Accountant to the South Eastern & Chatham Railway. Mr. Howie was an Investigator of Railway Companies' Accounts against the Government throughout the

MR. A. HOWIE,

Appointed Joint Accountant. Southern Railway.

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Government control period, and was in charge of financial arrangements at the Port of Richborough, including train ferry and barge services while these were worked by the South Eastern & Chatham Railway for the Government.

* * *

SIR DAVISON DALZIEL, Bart., M.P., Chairman of the Pullman Car Company, has consented to preside at the 64th anniversary festival of the United Kingdom Railway Officers' and Servants' Association, to be held at the Trocadero, on Wednesday, April 29.

* * *

THE Chief Commissioner for Railways, New South Wales (Mr. James Fraser), recently announced that the following officers had been appointed Area Commissioners, in accordance with the recommendations of the Fay-Raven Royal Commission :—

Mr. C. A. Hodgson, Metropolitan Area Commissioner.

Mr. W. C. Quinton, Northern Area Commissioner.

Mr. F. J. Williams, Western Area Commissioner.

Mr. J. D. Reid, Southern Area Commissioner.

* * *

MR. E. SHEPHERD, who has been appointed Treasurer, Southern Railway, in succession to Mr. T. Olding, retired, commenced his railway career in the Traffic Department of the L. and S.W. Railway in 1885. He served at various stations, being on the clerical relief staff until 1897, when he was transferred to the Pay Office, Treasurer's Department. He was appointed chief of the Pay Office on Mr. Swift's retirement in September, 1919, and was selected to assist the late Treasurer, Mr. Olding, in March, 1924. His new appointment as Treasurer dates from January 1, 1925.

MR. E. SHEPHERD,

Appointed Treasurer, Southern Railway.

LT.-COL. F. A. C. LEIGH,

Electrical Engineer, London Midland and Scottish Railway.

* * *

K. W. J. mentions that new bogie trains are now being operated on the Caledonian Clyde coast services to and from Glasgow, and that they are fitted with vacuum instead of Westinghouse brake apparatus. They are generally worked by dual-fitted 4-6-2 tank engines, though a number of 4-4-0 and 0-6-0 tender engines are also available for working vacuum-braked trains.

* * *

THE Model Railway Club has booked the Kingsway Hall, Kingsway, London, W.C., for an exhibition of members' work, &c., to be held on Friday, April 17, from 2 to 10 p.m., and Saturday, April 18, from 10 a.m. to 10 p.m. Admission charges will be 1s. 3d. adults, and children under twelve 6d., including tax in both cases. An interesting collection of exhibits is being gathered together. Hon. Secretary, Mr. R. Henvey, White Cottage, Shirley, near Croydon.

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WE regret to record the death on February 22, at King's Langley, of Sir Robert Turnbull, M.V.O. He was for a long period one of the best-known and most popular officers of the late London and North Western Railway, and since his retirement in 1914 continued to show on many occasions keen personal interest in matters affecting the staff of that company. Sir Robert Turnbull was a director of the London and North Western Railway Company from 1915 to 1922, and was appointed a director of the London, Brighton and South Coast Railway in 1915, on behalf of which company he was selected to be one of the directors appointed to the Board of the Southern Railway Company. Born in 1852, Sir Robert (then Mr.) Turnbull entered London and North Western Railway service in 1868; in March, 1877, he became an Assistant to the then Divisional Superintendent of the Liverpool District. From March, 1885, until April, 1887, he was District Superintendent in charge of the Southern Division, and for the next eight years was Assistant Superintendent of the Line for the entire system. On Mr. G. P. Neele's retirement in 1895, he was appointed Superintendent of the Line. On April 28, 1906, he was appointed one of the members of the Railway Employment Safety Appliances Committee, and was included in the New Year Honours of 1911 as a Member of the fifth class of the Royal Victorian Order. He received the honour of knighthood in April, 1913, on the occasion of the King's visit to Crewe. Sir Robert Turnbull acted as Chairman of the Superintendents' Conference of the Railway Clearing House in 1900 and was again elected to that position for 1911. In consequence of the death of Sir Frank Ree in February, 1914, and pending the late Sir Guy Calthrop's return from the Argentine to take up the position of General Manager, Sir Robert Turnbull was appointed General Manager, serving in that capacity until October, 1914, when he retired. In May, 1914, Sir Robert Turnbull was appointed a member of the Departmental Committee on Accidents to Railway Servants.

* * *

WE regret to record the death on February 20, at Trafalgar House, Birkdale, of Mr. John E. Charnley, late Manager and Secretary, Cheshire Lines Committee, in his sixty-second year. Mr. Charnley's retirement, owing to ill-health, was announced as recently as our issue of March, when biographical particulars were included. The interment took place on February 23 at Birkdale Cemetery, following a service at Trafalgar Road Congregational Church, Birkdale.

THE London and North Eastern Railway have placed orders amounting to £540,000 for 202 passenger carriages, including 6 complete articulated suburban trains of 8 coaches each, with the following firms: Midland Railway Carriage and Wagon Co. Ltd., Birmingham, 23 carriages (including 9 first-class) and 3 complete suburban trains; Clayton Wagons Limited, Lincoln, 20 carriages (5 third-class, 13 third brakes, and 2 compo. brakes) and 2 complete suburban trains; Metropolitan Carriage, Wagon and Finance Co. Ltd., Birmingham, 40 third-class carriages and 1 suburban train; Birmingham Railway Carriage and Wagon Company, 24 carriages (10 third-class and 14 third brakes); Craven's Railway Carriage and Wagon Co. Ltd., Sheffield, 27 carriages (15 third-class and 12 third brakes); Hurst, Nelson and Co. Ltd., Motherwell, 5 third-class carriages; Gloucester Railway Carriage and Wagon Co. Ltd., 10 third-class carriages; R. Y. Pickering and Co. Ltd., Wishaw, Glasgow, 5 third-class carriages. All these new carriages will be fitted with electric lighting and steam heating.

* * *

WORK has been commenced on the entire reconstruction of Piccadillly Circus station, London Electric Railway. The new station will be oval in shape, with a large circulating area. Five escalators will connect the booking hall with a landing from which four more escalators will run, two feeding the Piccadilly line and two the "Bakerloo." Fifteen passimeters will be installed.

* * *

IN view of the retirement of Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent, Southern Railway, from the presidency of the Institution of Railway Signal Engineers at the end of his year of office, it is of interest to note that, during 1924, Mr. Thorrowgood held no fewer than four presidencies in connection with railway signal and telegraph work. Thus he was President of the Institution of Railway Signal Engineers, of the Electrical and Telegraph Conference, which held its final meeting on February 11, and of the new Telegraph Engineers' and Signal Engineers' Conferences, which have been set up in connection with the Railway Clearing House.

* * *

INQUIRING into the accident on January 30, on Owencarrow Viaduct, on the Burtonport Extension line, Londonderry and Lough Swilly Railway, Mr. T. M. Batchen, inspecting officer, recommends that the railway company should be advised to provide two anemometers of the Dines type, which records not only the average wind

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velocity, but also the velocity in gusts, and have them erected at selected sites west of Kilmacrenan; also that when the wind reaches a velocity which is dangerous to trains all traffic on the line should cease.

* * *

AN additional line is to be constructed by the L.N.E.R. between Barnsley Junction and Penistone station, a distance of about a mile, for the accommodation of goods traffic. A loop line will run along the south side of the existing line and will relieve the main line of a great deal of traffic. It will thus considerably facilitate passenger traffic. The cost of the new loop line is £11,000.

* * *

COMMENCING March 2 the following stations on the Great Southern Railways, Ireland, were closed: Athlone (G.S. & W.R.); Clara (M.G.W.R.); Wexford South (G.S. & W.R.); Harcourt Street, Dublin (Goods depot). Traffic dealt with at these stations is now dealt with at Athlone (M.G.W.R.), Clara (G.S. and W.R.), Wexford (D. and S.E.R.), and North Wall (M.G.W.R.) (Goods depot) respectively.

* * *

THE 10,304 engines belonging to the L.M.S.R. travelled, during the twelve months ended December 31 last, a total distance of 231,311,000 miles.

* * *

SPEAKING at the annual meeting of the Londonderry and Lough Swilly Railway, Sir John M'Farland, Bart., said that the financial position of the company was desperate, and unless something was done in regard to the high wages paid the employees, the company would have to close the line. If the wages did not come down the employees would have to find other positions for themselves.

* * *

A SPECIAL G.W.R. sleeping-car train, with passengers landed from the United States Line steamer *George Washington*, left Plymouth at 2.37 a.m. on Friday morning, February 20, completing the journey to Paddington by 6.31 a.m., having covered the 227 miles non-stop in 3 hours 54 mins. The train was drawn by a four-cylinder engine, No. 4032, *Queen Alexandra*, 4-6-0 class, driver Salter.

* * *

BOROUGH station, "City" Railway, has hitherto remained closed for the completion of enlargement and improvement works on the Southern Section of the Old City and South London Railway. It was used, in fact, more or less as a workshop for the section. This station was, however, reopened for traffic on February 23. The buildings have been entirely reconstructed, and a new booking hall provided, together with other improvements.

* * *

THE eighth annual meeting of the London "Safety First" Council was held on February 25 at the Mansion House. In the absence of the Lord Mayor (Sir Alfred Bower), the chair was occupied by Mr. Sheriff Downer. A communication was read on behalf of the Duke of York (Patron of the Council), emphasising his continued interest in the work and the progress of the London "Safety First" Council. The Lady Mayoress afterwards presented 100 meritorious service badges and awards to successful competitors in the Freedom from Accidents and Railwaymen's Essay Competitions.

* * *

COMMENCING March 1, a number of additional and altered trains were placed in service on various sections of the L.N.E.R. A few special items, however, call for detailed reference. These include the through carriages run between London (King's Cross) and Scarborough on the 4 p.m. down and 10.37 a.m. up, and a restaurant car provided on Sundays on the 10.10 a.m. from Newcastle (Central) to London (King's Cross). Seaham Colliery station has been renamed Seaham, while the present Seaham station is to be known as Seaham Harbour.

* * *

THE L.N.E.R. directors have sanctioned an expenditure of £35,000 for the construction of a new station for Welwyn Garden City. The present station is situated on the Luton branch of the L.N.E.R., but the new station will be on the main line. It will consist of two island platforms between which the North and South main lines to Scotland and King's Cross will run, and these platforms will be capable of being served by main line trains and by trains running on the Hatfield–Luton and Hatfield–Hertford branches. The platforms are to be protected by roofing, and the usual waiting rooms and accommodation will be provided. The station buildings will front on to Howard's Gate, which leads to the Town Plain, and are to be laid out so as to lend themselves to future extension as traffic necessities may require.

* * *

ALL standard vestibuled carriages on the L.N.E.R. are in future to be 60 ft. in length and non-vestibuled coaches 51 ft. It is also announced that Pullman vestibules are to be made standard, and that articulated designs are to be utilised as far as possible. On the wagon side, 11,750 new wagons are covered by the 1925 wagon-building programme, with a carrying capacity of 160,000

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tons. At the beginning of 1923 there were 60 types of wagons on the L.N.E.R. These have been reduced to 21 in five main classes, while, instead of 40 different brake vans, one standard design has been adopted for goods traffic.

* * *

THE Requirements in regard to the Opening of Railways, which were last revised by the Board of Trade in 1914, have now been revised and amplified by the Ministry of Transport, and have been published under the title "Requirements for Passenger Lines and Recommendations for Goods Lines of the Ministry of Transport in regard to Railway Construction and Operation." Copies may be obtained from His Majesty's Stationery Office (price 3s.).

* * *

THE Minister of Transport has recently made the following Order :—"The Southern Railway Order, 1925, authorising the construction of a railway and other works and the acquisition compulsorily or by agreement of lands in the Borough of Ramsgate and the Urban District of Broadstairs and Saint Peters in the County of Kent by the Southern Railway Company."

* * *

IN connection with the electrification of the South Eastern and Chatham routes colour light signalling is being installed. They will include signalling as proposed by Mr. W. J. Thorrowgood, providing for red, yellow, double yellow, and green indications, operating, of course, in conjunction with track circuit.

* * *

THE Victorian Railways have placed an order with Messrs. Beyer, Peacock & Co. Ltd. for two 2-6-2-2-6-2 "Garratt" locomotives. These are for the 2-ft. 6-in. gauge lines. They will be extremely powerful for the gauge, the tractive effort approximating to 25,000 lb., and the total weight of each locomotive being about 80 tons.

* * *

THE Minister of Transport has made the undermentioned Order :—"The Newport and Four Ashes Light Railway Order, 1925, authorising the construction of a light railway from Newport in the County of Shropshire to Four Ashes in the County of Stafford."

* * *

THE Rhodesian Railways have placed an order with Messrs. Beyer, Peacock & Co. Ltd. for four 2-6-2-2-6-2 "Garratt" locomotives. These will have a tractive effort of about 35,000 lb., with a maximum axle load of 13 tons.

FROM March 1 the L.M.S.R. night service to Belfast *via* Fleetwood has been accelerated by 50 minutes. The 5.20 p.m. ex Euston no longer conveys passengers for Fleetwood. A new Belfast boat express leaves Euston at 6.10 pm., and calling only at Crewe (9.4-9.10) arrives at Fleetwood at 10.40 p.m. The Belfast steamer continues to sail at 11 p.m.

* * *

SILVER diploma shields are being fixed in the booking halls at five "Underground" stations. These indicate that the stations have been distinguished for their tidy appearance, timekeeping of staff, good conduct and general efficiency, and are therefore the winners of the Underground Stations Competition for the half-year ending December 31, 1924. The stations are: Blackfriars (District); Paddington ("Bakerloo"); Earl's Court Group ("Piccadilly"); Hendon Group ("Hampstead"); and Chancery Lane (C.L.R.). In addition to the presentation of the "shields," monetary awards amounting to £100 will be distributed to the staff of the winning stations.

* * *

IN connection with proposals for a racecourse at Chepstow, it is understood that the Great Western Railway Company have promised to construct a station and to provide train services as required to serve the course when completed.

* * *

THE London and North Eastern Railway has completed the purchase of 48 locomotive engines of the 2-8-0 type from the Government. These engines will be used for heavy mineral traffic after being reconditioned at the Gorton shops of the company.

* * *

As a result of improvements at Holyhead, L.M.S.R., the Irish mail steamers are now able to use the inner harbour at Holyhead instead of the mail pier. This alteration, which came into operation March 8, allows passengers to pass under cover between train and steamer.

* * *

AT the Railway Club, 65, Belgrave Road, S.W.1, on February 20, Mr. C. J. Allen, A.M.Inst.T., A.I.Loco.E., the President, took the chair at the annual general meeting. The report and financial statement for the year 1924 received the approval of the members, and upon conclusion of the formal proceedings the President delivered his "presidential address." Mr. Allen invited a discussion, and several members availed themselves of this opportunity to debate the present circumstances of the British railways.

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At a meeting of the Great Eastern Lecture and Debating Society on February 4, Mr. A. E. Tattersall read a paper entitled "Power Signalling: How it may be Applied to Present-Day Operating Requirements and its Bearing on Economic Problems."

* * *

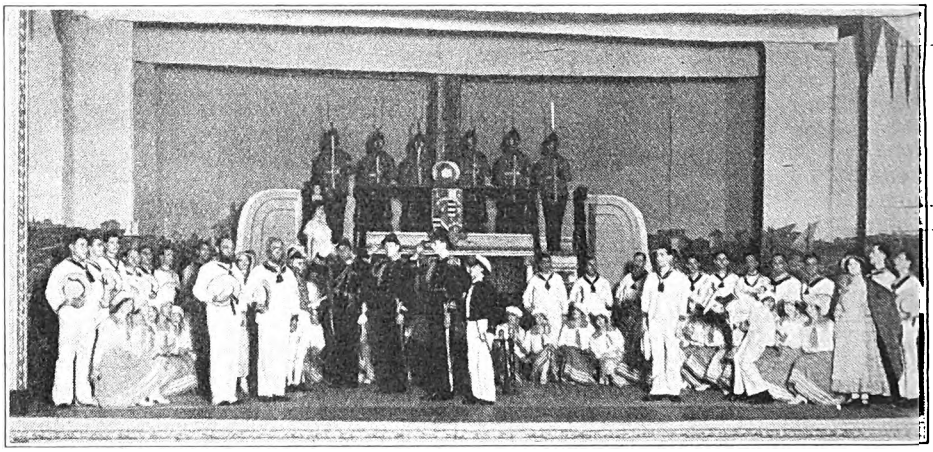
On February 2 Mr. Henry Greenly, A.I.Loco.E., gave a lecture to the Wimbledon and District Model Railway Club on "The Ravenglass and Eskdale 15-in. Gauge Railway." Many technical and operating problems were touched upon, and an interesting series of lantern views was shown. On February 28 a visit was paid to the Southern Railway School of Signalling at East Croydon. On March 2 a lecture was given by Mr. G. Lenton on "Railway Signalling." This lecture also was illustrated by lantern slides. On April 6 a lecture will be given on "Modern Boilers," by Mr. R. Clarke, and on April 25 a visit will be paid to Messrs. Stuart-Turner's works at Henley-on-Thames. The Hon. Secretary of the Club is Mr. R. Shephard, 27, Bernard Gardens, Wimbledon.

* * *

The ninth performance of the dramatic section of the T.O.T. Philharmonic Society was presented at the New Scala Theatre, Charlotte Street, W., on Thursday, Friday and Saturday, February 19, 20 and 21, and attracted large and appreciative audiences. Once again the wit and melody of Gilbert and Sullivan were laid under contribution, the plays chosen being "Trial by Jury" and "H.M.S. Pinafore." As some of the principals appeared in both pieces they were afforded opportunity of showing their versatility. The ladies and gentlemen of the chorus rendered valuable service throughout and reflected great credit—as, indeed, did the production as a whole—on Mr. Emil Hardy, the stage manager, and Mr. Charles Lambert, the musical director, whose well-controlled orchestra worked with ease and efficiency throughout.

* * *

The third annual Bohemian concert of the Metropolitan Railway Athletic Association was held on Friday evening, February 27, at the Queen's Hall, Langham Place, W. A delightful and variegated programme was provided, which received the enthusiastic approval of the large audience. The artistes were supplemented by the band of H.M. Grenadier Guards.



T.O.T. PERFORMANCE OF "H.M.S. PINAFORE," FEBRUARY 19–21.

In addition to the "King Arthur" class of named engines of the Southern Railway, we understand that it is intended to name most of the new or re-built express locomotives, together with a few other engines, and that, as far as possible, the various series will be named systematically. Thus the "Brighton" "Atlantics" are to be named after headlands, and Mr. Maunsell's 2-6-4 tank engines of the "790" class after rivers, while other series will take the names of schools, castles, &c. An album, including illustrations of various engines, together with text particulars, is in course of preparation, also postcards to be sold at popular prices.

* * *

On March 16, at Fillebrook Baptist Church, Leytonstone, Mr. J. F. Gairns, Editor of the Railway Magazine, gave a lantern lecture on the "Romance of the Railway Centenary." There was a good attendance and the lecture was well received.

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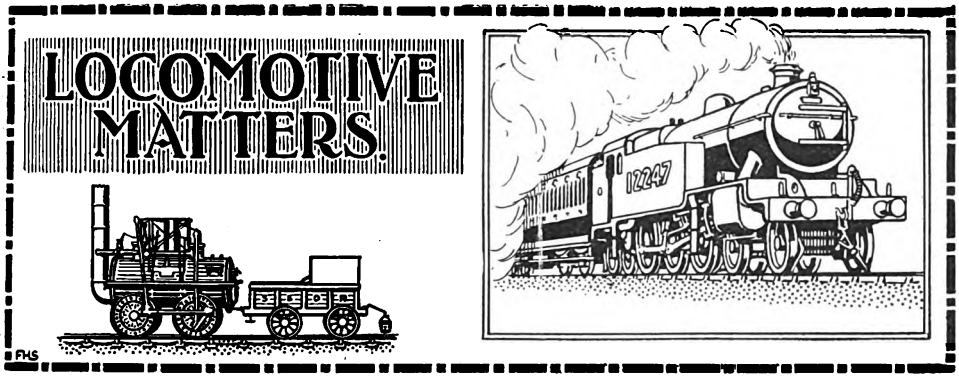

Under this heading will be inserted short references to news items relating to locomotive engines and their duties. It must be understood, however, that information as to the stations of particular engines cannot be given, for the reason that, before the date of publication, transfers may have taken place, while lists of engines, &c., debarred from "The Why and the Wherefore" section, cannot be included under this heading. With this understanding, notes as to matters thought to be of general interest will be welcomed.

L.M.S.R.

MIDLAND 0-6-4 tank engines, Nos. 2002, 2009, 2032 (rebuilt 1924 at Derby) and 2039, among others, have been rebuilt with Belpaire boilers, "Midland" lubricators, and extended smokeboxes. The new smokeboxes project considerably in front of the long side tanks. Presumably, they have been superheated at the same time. An old Midland Pullman-car body is employed outside Hellifield station as a tool shed, and another is so utilised at Skipton. A Glasgow and South Western Railway 0-6-2 tank engine is regularly employed in the Midland yard at Carlisle.—[A. W. P. M. and G. S. HARKER.]

Midland "single" locomotives recently noted in service include Nos. 614, 619, 632, attached to Liverpool shed, and Nos. 660, 661, 662 at Bedford shed, while No. 663 has been observed piloting the evening mail to Birmingham on the West of England line through Cheltenham.—[W. K. NASH, W. T. THORNEWELL and G. S. HARKER.]

West of England expresses through Cheltenham are now frequently hauled by Midland compound 4-4-0's. Among those seen are Nos. 1060, 1025 and 1027. No. 1043 has returned to Kentish Town sheds from Derby after being superheated. Nos. 1037 and 557, mentioned in these columns last month as working between Euston and Birmingham, have now reappeared on their own section. No. 557 is shedded at Kentish Town. 4-4-0 No. 765 of the Midland section, bearing the L.M.S. coat of arms, has visited Oxford recently, while 4-4-0's Nos. 353 and 1056 have been noted at Manchester.—[R. H. WILD, W. K. NASH, W. T. THORNEWELL, J. L. THORPE and "MIDLAND."]

Kirtley 2-4-0 engine No. 76 has appeared repainted but minus the coat of arms on the cab splasher.—["MIDLAND."]

0-6-0 No. 3943 has been working main-line goods trains over the Caledonian system.—[JOHN A. HODGE.]

Referring to "Manchester Reader's" report in our November, 1924, issue, in which he mentions L. & N.W. section 4-6-0, No. 1100 *Lusitania*, of the "Prince of Wales" type, as being stationed at L. & Y. Newton Heath, Manchester sheds, this engine is at L. & Y. Low Moor depot, near Bradford, and, as stated by our previous correspondent, works L. & Y. trains, chiefly expresses, between Bradford, Manchester and Liverpool. Several L. & Y. 4-cylinder 4-6-0's have gone on to the L. & N.W. section, while L. & N.W. "Prince of Wales" class Nos. 272 and 614 are stationed at Manchester L. & Y. sheds, and No. 5814 at Low Moor. This latter engine also appears on Bradford, or Leeds, to Manchester and Liverpool expresses.—[CLIFFORD MARSHALL.]

L. & Y. 0-8-0 locomotive No. 1456 has been working goods trains on the Bletchley–Oxford branch. 4-6-4 tank engine No. 11114 is now running in L.M.S. passenger colours.—[J. L. THORPE and R. H. WILD.]

Caledonian locomotives which have recently left Perth shops include 4-4-0 No. 14331, 0-4-4 tanks 15209 and 15234, 0-6-0 tanks 16202 and 16220, and 0-6-0 tender engine No. 17400. The old numbers were, respectively, 775, 154, 430, 383, 399, and 718. Pickersgill 3-cylinder 4-6-0 locomotives Nos. 14800 and 14803 are stationed at Perth South shed.—[JOHN A. HODGE.]

Further Wirral tanks noted in Manchester Exchange station are Nos. 11 and 13.—[R. H. WILD.]

L.N.E.R.

4-6-2 engines Nos. 2547, 2548, 2550, 2551, which were stationed at Gorton, have been

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removed to Grantham shed, and have been working on the G.N. section. No. 2547 has lately been handling the 10 a.m. down morning "Scotsman."—["NORTHERNER."]

Pacific type engine No. 4472 has been running on slow and fast passenger trains between Doncaster and Peterborough since its visit to Wembley. The plates bearing the name "Flying Scotsman" have been removed, and the engine is now unnamed. No. 2555, one of the Doncaster-built "Pacifics," carries the name "Centenary."—[P. RANSOME WALLIS and C. G. WOODNUTT.]

Of the new Darlington-built Mogul 3-cylinder engines, the following are employed on the G.N. section:—Nos. 69 and 91 at London; Nos. 73, 75, 80, 92, 112, 113, 114, 116, 118, 125, 127 and 140, at New England (Peterborough). No. 73 bears the date, "October, 1924," while Nos. 127 and 140 are dated "1925." G.C. R.O.D. 2-8-0 engines Nos. 6289 (shedded at Peterborough), 6253, 6377, and 6264 have been working recently on the G.N. section.

2-8-0 engine No. 3476 is fitted with Weir feed pump and heater.—["NORTHERNER," P. RANSOME WALLIS, and W. BECKERLEGGE.]

Great Central, North Eastern, and Great Eastern locomotives have been seen recently near Newark. Among them are G.C. "Sir Sam Fay" class 4-6-0's on the Harrogate Pullman, North Eastern "Pacifics" 2400 class on principal London, Edinburgh and Aberdeen expresses, and 3-cylinder "Atlantics" on semi-fast trains.—[R. S. MILLER.]

Darlington-built three-cylinder "Moguls" are now working the bulk of the fish traffic from Grimsby. During the summer months the through train from Leeds to Cleethorpes was always worked by a G.N. section rebuilt 4-4-0 from Ardsley shed, and by Ardsley men. This train avoids Doncaster by running over the West Riding and Grimsby section from Adwick Junction to Hatfield Junction. Also during the summer excursion trains were run to Cleethorpes from Leicester, Nottingham, Leen Valley Line stations, Derby, Burton-on-Trent and Tutbury *via* Sleaford and Boston, running over the "avoiding" line to the north of Grantham. The Leicester trains were worked by G.C. "Atlantics," and the remainder always by G.N. 4-4-0's. These trains had to reverse at Grimsby Town, and when three or four of them arrived in quick succession congestion became acute, accentuated by G.C. excursions coming in from the North Midlands. It was no uncommon thing for forty excursions to be dealt with at Cleethorpes, and some of these were in duplicate and triplicate.—[J. D. ROBINSON.]

Great Central locomotive No. 1165, *Valour*, is now in service again as No. 6165, retaining its name, after general overhaul and repainting in the new colours. It has been working trains between Manchester and Retford *via* Sheffield and Worksop (G.C. route). Another overhaul which is of interest to readers who are keen on the older types is that of the 4-2-2 "Single" No. 972, which is now No. 5972. Several of this type have gone to the scrap heap, including No. 967. An old "Sacré" 4-4-0 has been rebuilt with new cab, boiler and Belpaire firebox, and bears the number 6415. Other engines of similar class waiting their turn for the shops are Nos. 430B and 443B. The old "Sacré" 2-4-0 tank No. 450B was scrapped last January. Regarding "Pacifics," none have been noted here this year, although Nos. 2543, 2547, 2548, 2550, and 2551 have been noticed, in most cases fresh from Doncaster Works. Engines of other sections working here in 1924 have been 4-6-0 No. 8507, late G.E. section, and the regular working to Manchester of Great Northern "Atlantics" from King's Cross in connection with the Sheffield Pullman before it was altered in timing. Great Eastern section 0-6-0 tank No. 279E was shunter at Gorton Works during the summer months.—[C. G. WOODNUTT and P. RANSOME WALLIS.]

The following are the numbers of the fifty 2-6-0's now under construction at Darlington: 17, 28, 32, 33, 36, 38, 39, 46, 52, 53, 58, 69, 73, 75, 80, 91, 92, 109, 111, 112, 113, 114, 116, 118, 120, 121, 125, 126, 127, 134, 135, 140, 141, 143, 146, 150, 153, 156, 158, 159, 163, 167, 170, 178, 180, 184, 186, 191, 195, 200. Of these up to 125 were completed last year, and Nos. 126, 127, 134, 135, 140, and 141 this year. The following new locomotives are on order at Darlington: 5 class X 4-8-0 tank engines, 15 4-4-0 tender engines, 43 class J38 locomotives, and 10 additional 2-6-0 locomotives.—[E. HAIGH.]

Locomotives renumbered on G.E. section to date include 0-6-0 engine No. 39, now No. 07039; 0-6-0T, formerly No. 327, now No. 7327E; 4-4-0 Super-Claud No. 1781E, now 8781E. G.E. section 4-4-0 rebuild of the T19 class No. 7731E is at present working the Braintree branch line. No. 8898, 4-4-0 type, was noticed running light on the G.N. recently.—[G. H. YOUNG and "NORTHERNER."]

The following G.N. 4-4-0 superheater locomotives are in service in the "N.B." area: Nos. 3051 (Haymarket), 3052 (Dunfermline Upper), 3054 (Hawick), 3059 and 3061 (Eastfield), and 3057. No. 3052 is at present used for banking purposes at Inverkeithing, while 3051 works to Larbert. All these locomotives have reduced chimneys and domes. G.N. ("Kitsons") (1921)

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2-6-0's Nos. 4691, 4700, and 4704 are shedded at Eastfield. Two G.C. "Parker" 0-6-0 goods locomotives, Nos. 5633 and 5634, are now at Parkhead shed, and No. 5657 is at Polmont. Nos. 5647 and 5658 are also on this section. Among various engines recently withdrawn from service are Nos. 320B, 9322, and 9342 of the "Holmes" 317 class. These engines were only painted L.N.E. green last year. No. 9849 class B 0-6-0 has been rebuilt with a superheater boiler and "pop" safety valves, whilst others of the class are being similarly treated. Several of the 836 class 0-6-0T (outside cylinders) are being rebuilt at Cowlairs with new boilers, having the closed dome and "pop" safety valves over the firebox. One of Mr. Reid's original 0-6-2T's, No. 9863, has been rebuilt similar to his later class, with safety valves over the firebox instead of on the dome, and is now dual fitted. It is stationed at Haymarket depot. No. 9831 is the latest class D 0-6-0T to be rebuilt. Superheater "Scott" class engines Nos. 9411, *Dominie Sampson*, and 9414, *Dugald Dalgetty*, have returned to Haymarket with new boilers and Gresley snifting valves behind the chimney in place of those of the N.B. pattern at the base of the smokebox.—[W. D. M. STEPHEN and W. E. BOYD.]

G.W.R.

"Castle" class engines, including *Caerphilly Castle*, frequently work through Oxford (G.W.R.), particularly on the 8.42 a.m. to Birmingham. 0-6-2T No. 191 [ex A(N) D.R. No. 30] and 0-6-0T No. 299 [ex T.V.R. No. 98] have been noticed at Swindon with G.W.R. boilers, &c. The "shuttle" service between Swindon Junction and Swindon Town has recently been worked by M.S.W.J.R. 4-4-4T No. 17, still in its old colours.—[J. L. THORPE.]

No. 2925, *Saint Martin*, has been rebuilt with 6-ft. wheels and the "Castle" pattern cab. Her tractive effort is now 27,300 lb. at 85 per cent., or only slightly less than the "Stars," and she is the first of ten "Saints" to be so treated. All small tank locomotives on the Great Western are to be fitted with the new pattern enclosed cab, a great improvement on the old types. No. 3804, *County Dublin*, has appeared at Paddington with the bogie tender formerly attached to *The Great Bear*.—[J. FRANCIS PARKER.]

S.R.

The first batch of Drummond 4-6-0 (330-334) have been rebuilt as 2-cylinder engines and are identical in appearance with the new 473 class, except for Drummond tenders and non-conical boilers. The second series, Nos. 448/457, are to be similarly treated. No. 742 of the 736 class of 4-6-0 is still running with a Drummond type chimney. Two of the small Drummond 4-4-0's, Nos. 707 and 726, have been fitted with snifting valves of similar pattern to those used on the Woolwich-built Moguls. No. 312E and 314E are superheated and have six-wheeled tenders, snifting valves, capuchons cut off short, and Maunsell pattern lubricators. 443 class 4-cylinder 4-6-0's are to be rebuilt with two 20½-in. by 28-in. cylinders, long travel piston valves, and a boiler pressure of 200 lb. The 448 class will be similarly rebuilt but will retain the 6-ft. 1-in. wheels. The new 4-6-0's under construction follow Mr. Urie's design with a few modifications, notably 20½-in. by 28-in. cylinders and a higher steam pressure. 30 of the A type Moguls will shortly appear on this section.—[R. S. JOHN, K. H. S. MASSEY, A. W. SMITH.]

0-6-0 locomotive 536B has been rebuilt, and 0-6-2 radial tank No. 593B has been employed on Charing Cross and Redhill services.—[A. W. SMITH.]

S.W. section 4-4-0 locomotive No. 421 of the larger 6-ft. 6-in. class, famous as the engine involved in the Salisbury disaster, has been transferred to the Brighton section. For about a week it was in evidence on coast line trains, making five journeys daily between Brighton and Portsmouth. Since this it has been daily employed on the "Sunny South" express between Brighton and Willesden Junction.—[W. H. DONOHUE and F. BRIDGER.]

10 tank engines of the 2-6-4 type are being built for this section.—[A. W. SMITH.]

Irish Railways.

The Great Northern now have all their new 4-4-2 tanks in service, and also some new superheated 0-6-0 type main line goods engines. These latter are similar to the previous engines of the class, with the exception that the heating surface has been reduced from 1,354 to 1,250 sq. ft. Two of them, Nos. 17 and 19, take the number of old Class B engines, which have been scrapped. Eight of the older 4-4-0 engines were lately broke up.—[K. A. MURRAY.]

Superheaters have been fitted to the M.G.W.R. locomotives Nos. 26, *Croagh Patrick* (4-4-0), 16, *Rob Roy* (2-4-0), and 34 *Aurora* (2-4-0). Several M.G.W. and G.S. and W. locomotives were sent to Grand Canal St. shed, Dublin, D. and S.E.R., among them being M.G.W. 0-6-0 type tank engines Nos. 106, *Lark*, 110, *Bat* and 115, *Achill*.—[K. A. MURRAY.]

G.S. and W. 4-6-0 engine No. 400 has recently left the shops fitted with the new style of cab with extended roof and large tender similar to the English-built engines

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of the same class. The new 4-8-0 shunting tank locomotive No. 901 has been in service since December. Several D. and S.E.R. locomotives are in course of repair at Inchicore.—[K. A. MURRAY.]

G. and S.W. 0-6-4 tank and 4-4-0 and 0-6-0 tender engines now work regularly over the late D. and S.E. roads in the Dublin area, presumably in order to release a large percentage of D. and S.E.R. engines for much needed repair.—[C. O'HARE.]

Messrs. Beyer, Peacock & Co. have delivered two new 4-4-2 tank engines, similar to Mr. Cronin's large engine No. 20, but with Belpaire fireboxes and cast-iron chimneys. They carry the Nos. 34 and 35, formerly borne by 2-2-2 tanks now scrapped.—[K. A. MURRAY.]

SOUTHERN RAILWAY TUNNELS.

THE February issue of the *Southern Railway Magazine* gives particulars of practically all tunnels on the London, Brighton and South Coast section. As a matter of interest, we reproduce these below :—

Name of Tunnel and Line.	Length in yards.
Balcombe, Main line	1,133
Betchworth (Dorking), Leatherhead and Horsham	385
Bopeep, East Coast line	1,311
Cinder Hill, East Grinstead and Lewes line	63
Clayton, Main line	2,266
Cliftonville, West Coast line (Preston spur)	536
Cocking, Chichester and Midhurst line	740
Coombe Lane, Woodside and Croydon line	157
Crystal Palace, West End line	745
Denmark Hill (London Bridge side), South London line	231
Denmark Hill (Victoria side), South London line	62
Ditchling Road, East Coast line	63
East Grinstead (No. 1), Tunbridge Wells line	78
East Grinstead (No. 2), Tunbridge Wells line	48
Edenbridge, Oxted and Groombridge line	319
Falmer, East Coast line	495
Grove, Tunbridge Wells Link line	190
Hastings, East Coast line	783
Haywards Heath, Main line	250
Heathfield, Tunbridge Wells and Eastbourne line	266
Hove, West Coast line	231
Kemp Town, Kemp Town line	946
Kingston, East Coast line	103
Knight's Hill, South London and Sutton line	331
Leigham, South London and Sutton line	302
Leigham Court (Streatham Hill), West End line	443
Lewes, Keymer line	397
Limpsfield, Croydon, Oxted, and East Grinstead line	550
Lywood, Horsted Keynes and Haywards Heath line	218
Mark Beech, Oxted and Groombridge line	1,338
Merstham, New Main line	2,113
Merstham, Old Main line	1,830
Mickleham (Boxhill), Leatherhead and Horsham	530
Midhurst, Pulboro' and Midhurst line	276
North Stoke, Mid-Sussex line	84
Oxted, Croydon, Oxted and East Grinstead line	2,266
Park Hill, Woodside and Croydon line	121
Patcham, Main line	488
Redhill, New Main line	502
Riddlesdown, Croydon, Oxted and East Grinstead line	836
Rotherfield, Tunbridge Wells and Lewes line	1,020
Rudgwick, Horsham and Guildford line	330
Singleton, Chichester and Midhurst line	744
Streatham, South London and Sutton line	220
West Dean, Chichester and Midhurst line	443
West Hoathly, East Grinstead and Lewes line	730
Woodside, Woodside and Croydon line	264

It will be noticed that there is no "longest" tunnel, there being two of exactly the same length, Clayton and Oxted, each 2,266 yards long.

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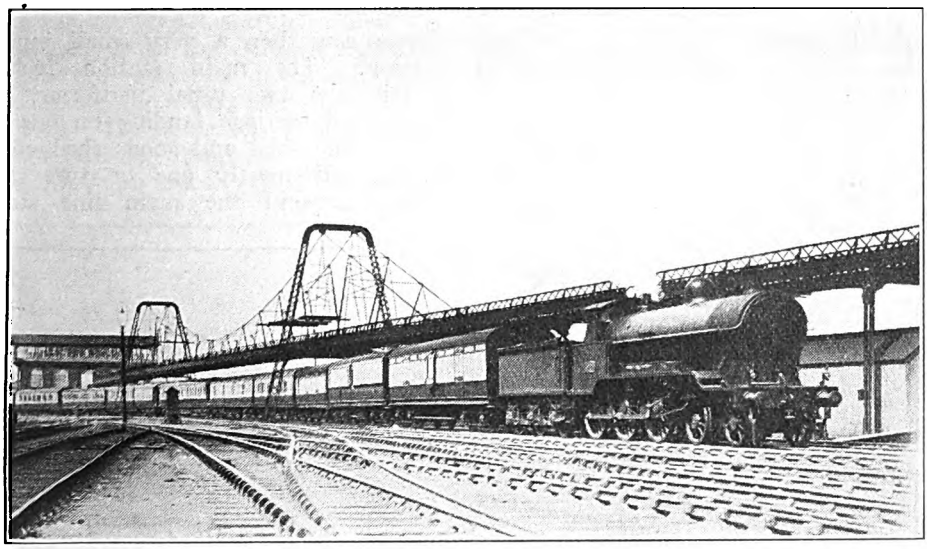

Photo.] **IRISH MAIL ENTERING CREWE.** [*W. H. Whitworth.*

4-6-0 locomotive No. 964 "Bret Harte."

Notable Railway Stations and their Traffic.

CREWE, L.M.S.R.

By J. F. GAIRNS, M.Inst.T., M.I.Loco.E.

ALTHOUGH this famous station has received attention on various occasions in the pages of the RAILWAY MAGAZINE, as is, indeed, inevitable owing to its "key" position in regard to practically all main routes of the late London and North Western Railway, it has never hitherto figured under the heading of a "Notable Railway Station," to which title, however, it has an unquestionable claim. In the September, 1899, number a late London and North Western Railway officer, Mr. Gilbert J. Stoker, gave Crewe first place in a series of articles under the general heading of "The Result of Railway Enterprise," a distinction which applies to Crewe possibly even more than to any other place, in that it is pre-eminently a railway town, and although a few other industries are now located there, by far the greater proportion of its population is dependent directly or indirectly upon railway employment and railway activities. In the June, 1904, number, Mr. S. M. Philp, another late London and North Western Railway officer, described Crewe, with the sub-title "The Key to the London and North Western System." In that article the last great enlargement of the station was fully described, including reference to the avoiding lines then constructed for goods traffic and information in regard to the electric signalling installed about that time. That article, indeed, included a considerable amount of information concerning the station and its traffic. As a side issue, though the present article is not directly concerned therewith, mention may also be made of an article in the April, 1907, number, when Mr. F. W. West, then holding the position of goods agent at Crewe, described the lay-out, equipment and operation of Crewe tranship shed, one of the most remarkable and noteworthy of its kind.

While Crewe has already received attention in these pages to the extent indicated, its traffic importance and the exceptional interest attaching to train working there

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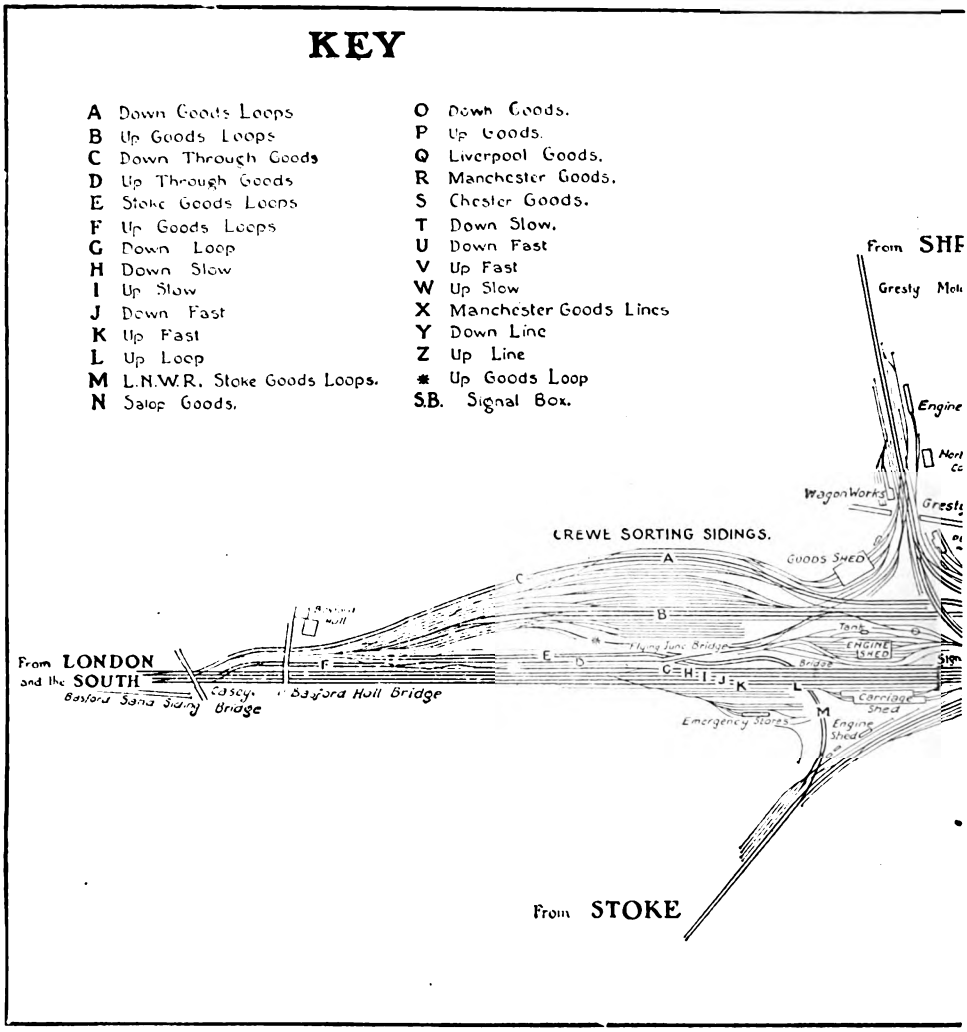
affords full justification for a new article, and by courtesy of officers of the London Midland and Scottish Railway, and with special acknowledgment of the friendly co-operation of Mr. T. Travers, stationmaster, the writer is able to place before readers of the RAILWAY MAGAZINE a comprehensive description of the lay-out, accommodation and traffic working.

An interesting feature of Mr. Stoker's article was the inclusion of a plan of Crewe, drawn from memory by Mr. W. E. Winby, son of Captain Winby, the first stationmaster at Crewe. This showed the lay-out as in 1842, indicating that Crewe was then a very small junction station. The main station included merely the two usual platforms, with horse and carriage landing on one side and engine shed and goods shed on the other, and merely one or two siding spurs. Beyond the main line station was a separate one with a single platform only, for the use of Manchester and Birmingham Railway trains. Except for a single line connection, this was quite clear of the Liverpool and Chester routes, between which the original portion of the works was located. Behind the up platform of the main line station was



GENERAL PLAN OF APPROACHES, SIDINGS

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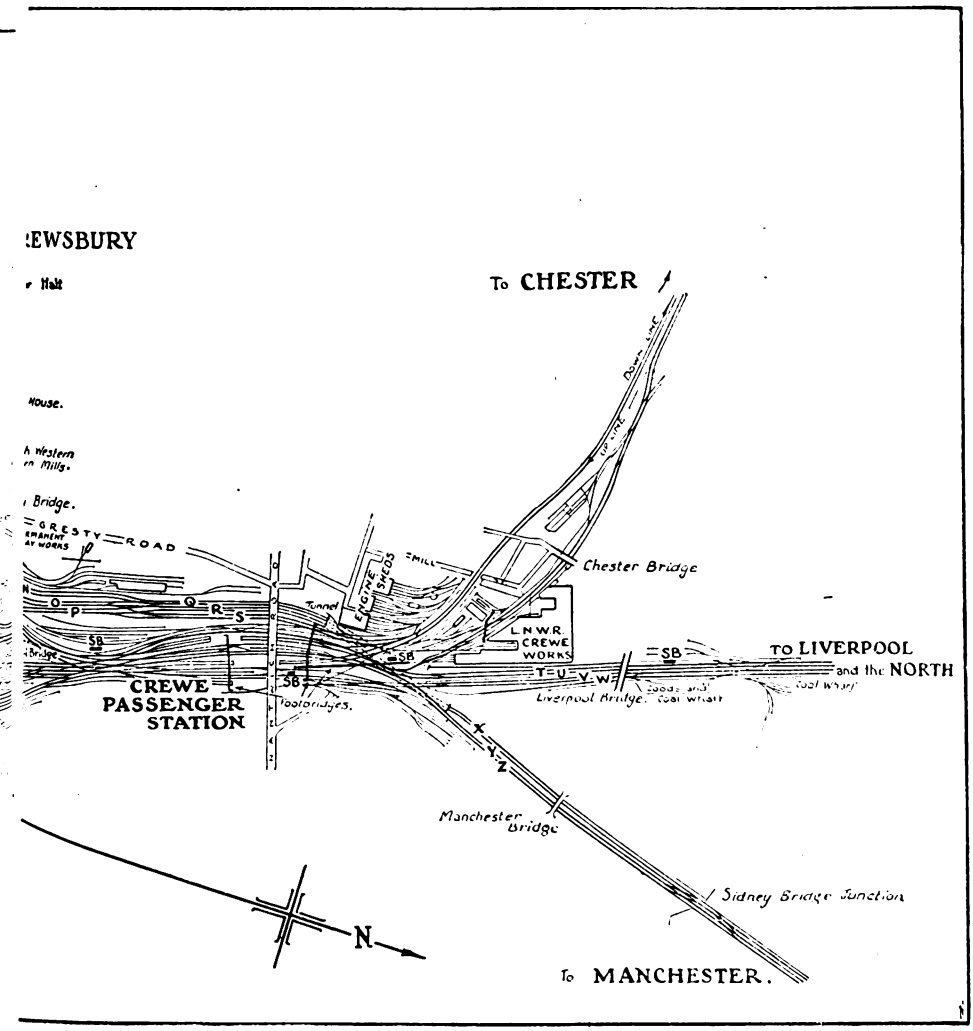
shown the Crewe Arms Hotel, which still occupies the same site, though extended and enlarged, and now takes a leading place among the many first-class hotels owned by the London Midland and Scottish Railway Company. Apart from the railway premises, the surroundings appear to have been essentially rural in character, a description which certainly cannot now be applied to the locality immediately adjacent to Crewe station.

In many ways the development of Crewe is bound up with the history of Crewe Works, dating from 1842-3, when the Grand Junction Railway transferred its works from Edgehill (Liverpool) to Crewe. Thirty acres of land were then purchased for the works, and 50 on which to erect houses. The total number of railway employees located at Crewe, including those employed in the works, was at that time about 200, whereas at present there are between 30,000 and 40,000 embracing all departments.



AND STATION AT CREWE, L.M.S.R.

Crewe station has necessarily been enlarged on a number of occasions, but, so far as the present generation is concerned, principal interest attaches to the lay-out immediately prior to the new works which produced the existing station, and the

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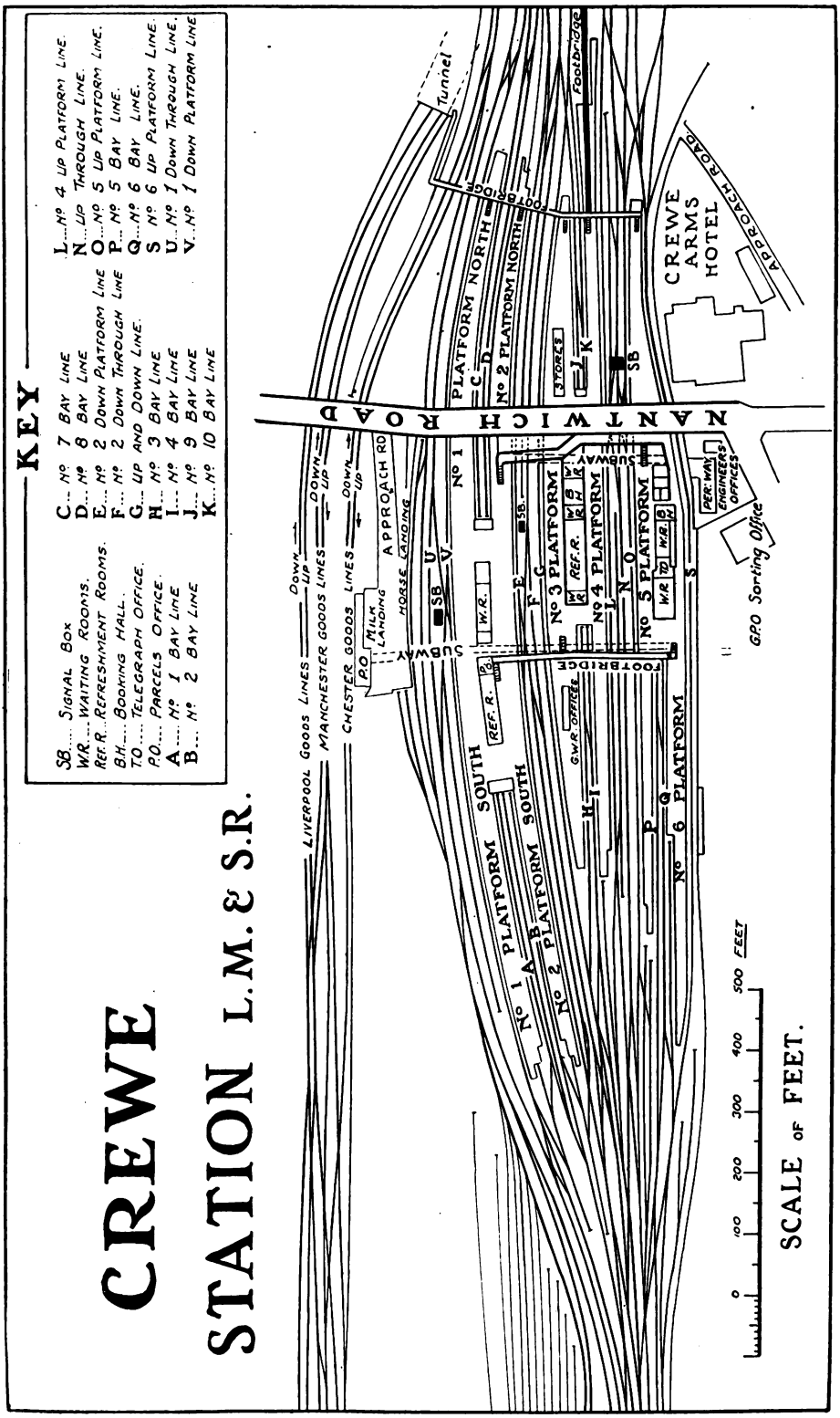

DETAILED PLAN OF CREWE STATION, L.M.S.R.

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arrangements which have applied for the last 20 years or so. In this connection, reference may be made to Mr. Phillp's article, with which plans were given as before and after the 1904 enlargement, the latter including the "avoiding lines" by which so much goods traffic is now routed without passing through the passenger station, a relief which had become imperative even 30 years ago, and without which it would be quite impossible to work the traffic of to-day. There were then two large island platforms only. One was the island enclosed between the present Nos. 5 and 6 lines, with Nos. 5 and 6 bays at the south end. The other was the island enclosed by the present Nos. 3 and 4 lines, in this case with two terminal lines let into each end. Between Nos. 4 and 5 platform lines were two middle lines, with midway scissors crossings, while beyond the present No. 3 platform line were two through lines for the use of goods or non-stopping trains, and having connection with the Manchester, Liverpool and Chester routes. The approach from the south was 4-track, the Shrewsbury and North Stafford branches making connections just south of the station as at present, the Shrewsbury connection being, in fact, immediately adjacent to the present South Junction box. All lines and routes had, however, access to any platform or line in the station. To the north there were four tracks in the Manchester direction, five towards Liverpool and the North, and two for Chester trains, all these routes having connections to or from each platform, though in some instances connections were with certain lines of the multi-track sections.

The enlargement of 1903-4 consisted principally of the addition of a further island platform, that enclosed between the present Nos. 1 and 2 lines, together with two terminal lines at the south end, with the very important addition of the goods avoiding lines. The latter, as will be gathered from the plan reproduced on pages 338–9, are of an extensive and far-reaching character, providing, in fact, for the working of goods traffic to and from every route, except that trains between the North Staffordshire section and the north must necessarily pass through the passenger station. These avoiding lines include several tunnel sections, together with connections in all directions. As a result, except for goods trains to and from the North Staffordshire section as mentioned, the only non-passenger trains which pass through the passenger station are those which are thus routed for convenience as being of a through or non-stop character.

There is no need in this article to deal with the system of avoiding lines or with the extensive goods yards and sidings in the immediate vicinity of the passenger station. That would, in fact, justify an entire article on its own account. To enable the general features of the lay-out to be appreciated, a plan is reproduced showing the lines and connections concerned. Confining attention, therefore, to the passenger station itself, the general lay-out may first be described in greater detail.

Crewe station is laid out so that Nos. 1 and 2 platforms and through lines are reserved exclusively for down traffic, No. 3 platform line is signalled for trains in either direction, while Nos. 4, 5 and 6 platform lines and No. 5 through line are reserved for up trains. At the northern end of No. 6 platform a portion is barricaded off, while at the middle part the station offices extend almost to the platform edge, so that only the southern end is available for entraining or detraining passengers.

There are six bays at the south end of Crewe station. Bays Nos. 1 and 2 are let into the south end of Nos. 1 and 2 island platform; bays Nos. 3 and 4 are correspondingly let into Nos. 3 and 4 island; and bays Nos. 5 and 6 are similarly located in regard to Nos. 5 and 6 island. At its outer end, No. 6 bay line has alongside it a short spur available for loading or unloading luggage vans, milk vans, &c. At the north end of the station, bays are let into two of the islands only. Nos. 7 and 8 bays are thus fitted between Nos. 1 and 2 platform lines, and Nos. 9 and 10 bays between platform lines Nos. 3 and 4.

Seeing that all the bay lines are long enough to accommodate trains of reasonable length, while between the north and south bays in the case of platforms 1 - 2 and 3 - 4 are long ranges of station premises, it will readily be understood that not only are the through platforms of great length, but that they can usually accommodate two trains simultaneously.

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Hence, connections are provided in each case, approximately intermediately, with middle or outside non-platform lines, so that, speaking generally, a train can enter or leave one of these platforms independently of another train using the south or north portion of the same platform. Because of this, it is usual on the station indicators to show that trains start from or arrive at the south or north portion of the through platform in question, though in these days, when trains of extreme length are so frequently operated, there are many occasions when it is necessary to allocate an entire platform to a train, owing to the fact that to bring the whole of it to a platform the intermediate crossings must be fouled.

The following are the lengths and traffic allocations of the respective platform lines :—

	Yards.	
No. 1 Platform	530	Down.
,, 2 ,,	473	,,
,, 3 ,,	360	Up and Down.
,, 4 ,,	429	Up.
,, 5 ,,	364	,,
,, 6 ,,	274	,,
,, 1 Bay	131	Arrivals and Departures South.
,, 2 ,,	130	
,, 3 ,,	127	
,, 4 ,,	132	
,, 5 ,,	144	
,, 6 ,,	100	
No. 7 Bay	192	Down — Departures North.
,, 8 ,,	190	,,
,, 9 ,,	94	,,
,, 10 ,,	144	Up — Arrival North.

Beyond No. 1 platform line is a through line used for shunting and other purposes, together with a length of siding at each end outside southern and northern lengths of windscreen, but inside the intermediate length of screen. Midway along is Station Box A, controlling adjacent shunting movements, and at this point connections are given from the through and siding lines in this direction to and from No. 1 platform line, the through line continuing outside the box but still within the protection of the intermediate length of windscreen. Outside the screen is a long milk platform, with an inclined road connecting with Nantwich Road, and beyond are further lines on which engines stand as required, while beyond again are goods lines associated with the "avoiding" system.

GENERAL VIEW ON No. 1 PLATFORM.

Bays Nos. 7 and 8 have no intermediate line, but Nos. 1 and 2 have a middle line, so that engines of arriving trains can be released while their vehicles remain in position. Adjacent to No. 2 platform the track lay-out is approximately a repetition of that alongside No. 1, but arranged

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reversely, with "B" signal cabin placed similarly to "A." The through line, which in this case is against the boundary wall of the old station, is, however, signalled as a through line for non-stopping trains, though it is also available for shunting movements. No. 3 platform stands by itself, in that the boundary wall just mentioned lies between it and the down through line. Next to No. 4, at the south end, is a siding line, and next to this again comes a through line available for non-stop up trains, which can thus pass a train standing at No. 5 platform immediately alongside.

open one, control is exercised over every one entering or leaving it, while an effective check can be maintained over passengers arrving at the station from any direction without need for collecting tickets at a previous station or while travelling. The footbridge mentioned also leads to a passage connecting with the Crewe Arms Hotel, so that passengers can proceed direct thereto without crossing the road, though in that case the hotel servants, being employees of the railway company, act as ticket collectors when admitting to the hotel visitors who have come by train or are proceeding by the covered way into

GENERAL VIEW ON No. 4 PLATFORM.

The station is spanned slightly to the north of its midway point by a bridge carrying Nantwich Road. The bridge also carries a wide passage, constituting a footbridge, serving all platforms by stairways, but there is no booking hall on this level. In that respect Crewe includes the characteristics of many of the older stations, as booking offices to suit the traffic of the various platforms are located thereon. To control public access, however, non-ticket holding passengers, as they enter the station, are given a platform ticket, and this has to be surrendered when purchasing a railway ticket or if leaving the station without travelling. Thus, though the station is practically an

the station. Approximately level with the buffer-stops of the southern bays is an ordinary footbridge providing communication between the three main island platforms. At the north end of the station, but unprotected, is a narrow footbridge with stairways to each platform, erected mainly for the use of employees in the locomotive works. About midway of its length this footbridge joins the long suspension bridge which figures so prominently in many photographs taken at the northern end of the station. This footbridge leads past the big North Junction signal cabin direct into the works premises. At one time narrow-gauge rails were laid along it, upon which the small works

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engines conveyed materials or supplies between the station and the works. It now constitutes an ordinary footway, though it has fewer passengers than formerly owing to the fact that operations are now largely concentrated in the newer portions of the works which are further away, and for which it is usually most convenient to utilise public-road access.

Platforms Nos. 1–2 and 3–4 each have, as already indicated, a large block of buildings in the space between the buffer-stops of the north and south bays. In the case of No. 1, behind the buffer-stops of Nos. 1 and 2 bays are staff offices, lavatories, and a bookstall. Next comes the main block of buildings, including hair-dressing saloon, dining and tea-room, first and third-class refreshment rooms, and cloak-room. Beyond a cross passage, in which is located the telegraph office, is a booking-hall and waiting-room, and ladies' and gentlemen's waiting-rooms. Along these buildings on each platform are small bookstalls, train indicators, fruit and tobacco stalls, &c., while on each side of the dining and tea-room is a large clock-face.

On the island serving Nos. 3-4 platforms somewhat similar accommodation is provided, a notable feature at the south end of the block of buildings being an extensive time-table display. Adjacent to No. 3 bay is a small building used by the Great Western Railway, and including that company's booking office. Further along the platform are refreshment rooms, waiting-rooms, booking-office, &c. While these two island platforms are complete in themselves, so far as passenger requirements are concerned, even to the extent of having their own windows showing train-running information, &c., the principal station offices are on Nos. 5-6 island. Here is a further range of refreshment rooms, waiting-rooms, booking-office, &c., together with a large bookstall, while adjacent to the buffer stops of Nos. 5 and 6 bays are the stationmaster's offices; also the principal telegraph office, to which those on other platforms are subsidiary. As already mentioned, the buildings in this case run close up to No. 6 line, so that only the portion south of the stationmaster's office is actually available for use as a platform. Except for portions at the south end, and particularly the southern sections of Nos. 1 and 2 platforms, together with Nos. 1 and 2 bays, the station is almost entirely covered by all-over

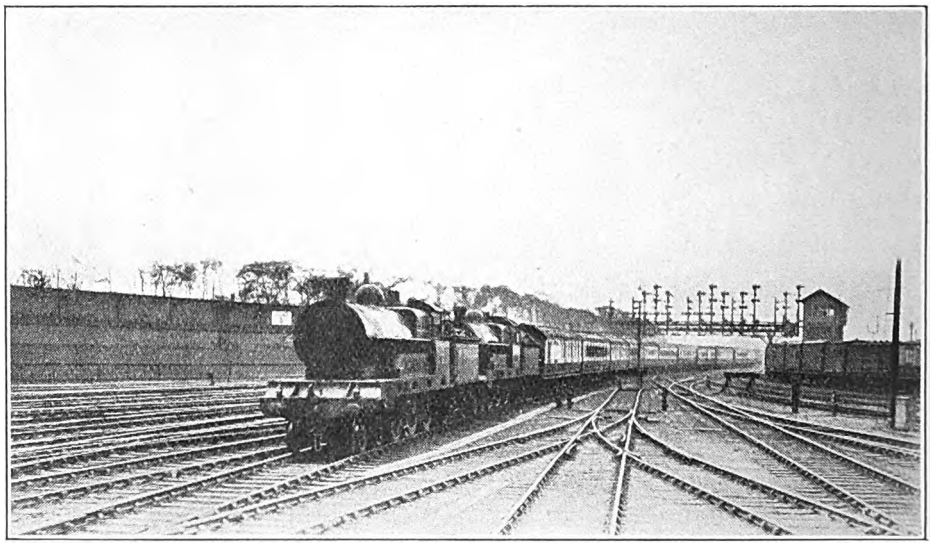

Photo.] [*W. H. Whitworth.*

DOWN MANCHESTER EXPRESS APPROACHING CREWE.

Locomotives Nos. 171 and 180 ("Llewellyn").

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glazed roofs of gable type. Elsewhere, transverse ridge and furrow roofing is erected to cover both through and bay platforms.

Approaching Crewe from the south, four running lines from the Stafford direction give access to every platform in the station, while adjacent to the South Junction box the Shrewsbury line makes connection on one side and the North Staffordshire line on the other. As these junctions are all in the immediate vicinity of the station, there is a complex series of connections and a large number of signals, the principal ones being erected upon one bridge spanning the main lines, together with similar signals covering the Shrewsbury line which comes in behind the South Junction box. Adjacent to the Shrewsbury Line are down carriage sidings, while numerous other sidings are located about the station area as required. The South Junction box contains 245 working levers, all of miniature electric type, on the Webb and Thompson system, but arranged in one long series divided at two points. The North Junction box covers all connections and all routes at the north end. This contains 265 miniature electric working levers. Work in the station is controlled by Cabin A, adjacent to No. 1 platform, and by Cabin B, alongside No. 2 platform, both of these boxes being electric; the number of working levers in each box is 26. On the up side, movements are controlled by what is known as the Scissors Crossing box, erected over No. 5 platform line and the adjacent through line. This has 25 working levers, but is partly electric. South Junction box is worked by three men per shift; North Junction box by two men and one "regulator" per shift; and the others by one man each.

While in the ordinary way Crewe does not constitute the starting or destination station for passengers in very large numbers, the situation becomes very different when employees and their families resident in the town are travelling. Even on an ordinary day some hundreds, and on Saturday thousands, of privilege tickets may have to be issued, and to avoid interference with ordinary passengers a special booking office for the issue of staff privilege tickets is provided adjacent to Nantwich Road. This is quite an extensive place, with a number of booking windows, in that, besides meeting ordinary requirements, it has to deal with the issue of tickets on a tremendous scale on the occasions of the annual staff trips, when there may be 11,000 or 12,000 to be despatched in one day. At such times numerous special trains are run in all directions. At public holiday periods, too, there is generally a very large volume of traffic of this kind, so that, were it not for this separate provision, the issue of privilege tickets to staff and their families would seriously congest the public booking offices.

So far as general traffic is concerned, week-ends are naturally the busiest periods at Crewe, and, during the summer months, Friday from noon to about 5 p.m. is probably responsible for greater pressure then even Saturday afternoon. This is due to the fact that numerous long-distance excursions are dealt with at the station, many involving extensive interchanges of passengers, while week-end traffic is by then beginning to make itself appreciably felt. It is not so much the traffic to and from London as that between Birmingham, Wolverhampton, Shrewsbury, Stoke-on-Trent and other towns south-west and south-east of Crewe, and the long chain of holiday resorts served by the North Wales coast lines, together with the favourite resorts on the Lancashire coast. It has to be remembered, also, that the London trains, whether for Liverpool, Manchester, Scotland or North Wales, are nearly all very heavy, and a large proportion of them are responsible for considerable interchange of passengers at Crewe to or from connecting trains. Incidentally, large aggregate numbers of passengers are accompanied by luggage, while there is always a big volume of parcels and other traffic not accompanying passengers, involving transfer at Crewe, although a relatively small percentage of it may have Crewe as its place of origin or destination. Among special traffics may be mentioned the conveyance, at certain periods in the year, of large numbers of vans, frequently as special trains, for pigeon-flying traffic alone. Lancashire and Cheshire are great counties for pigeon-flying, while the trains or through vans thus involved often make quite long journeys, including those to the South Coast, and occasionally with an

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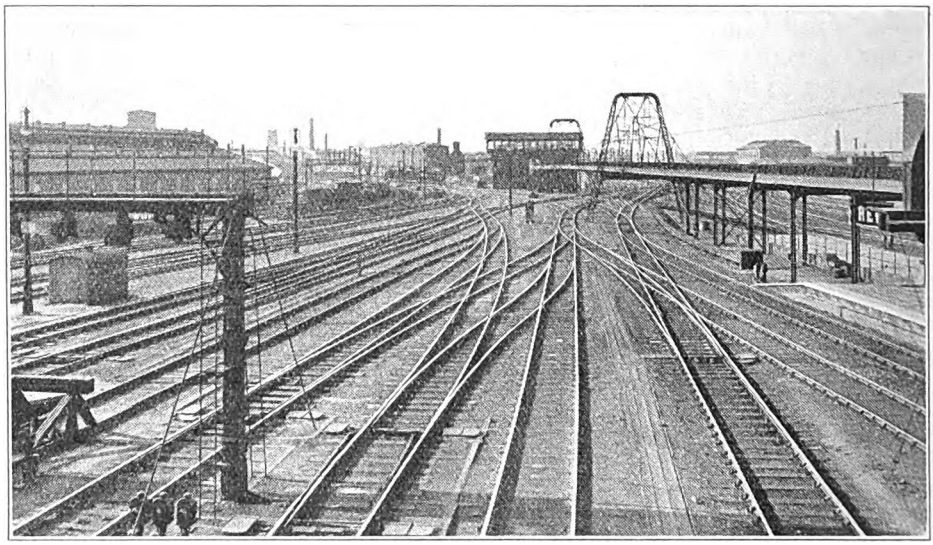
associated trip across to France, in the case of birds making long-distance flights. Other special traffic dealt with at Crewe includes, in the respective seasons, fruit from Gloucestershire, Herefordshire and the West of England, from France and the Channel Islands, and from Kent and Hampshire. Mushrooms, vegetables, rabbits and newspapers also add very substantially to the work entailed upon the platform staff at Crewe, and, in so far as these special traffics are of a variable nature, it is often necessary to strengthen the numbers usually required. In the ordinary way, however, what with the general luggage and parcels traffic, milk (a large item), newspaper and other traffic which passes regularly, the staff at Crewe is necessarily a considerable one. Fish traffic is naturally a very heavy item, there being, in fact, quite a number of through fish trains, many from Scotland, Fleetwood, Grimsby, Hull and, to a certain extent, other East Coast ports. Crewe also deals with a considerable volume of traffic to and from the Yorkshire lines. There is even a substantial amount of passenger traffic to and from those lines, in that for many places served by routes centring upon Crewe, a convenient way of making such journeys is afforded by the L.M.S.R.

Last, but by no means least, is the handling of the tremendous mail traffic which has, from the first, been concentrated on the West Coast route, and of which Crewe necessarily receives its full share of the burden. The down postal train leaving Euston at 8.30 p.m. is due at the south end of No. 2 platform at 11.44 p.m. It includes a postal van for Liverpool, due away at 12.8 a.m., and a Manchester van, going forward at 12.40 a.m., while the main train has vehicles leaving at 11.57 p.m. for Preston, Stranraer, Aberdeen and Glasgow. Preceding the through mail train are, however, various trains bringing either through vans or conveying traffic in considerable volume requiring to be transferred to the postal train, so that for an hour or more the staff at Crewe is fully occupied in handling this important traffic. Moreover, no sooner has the down postal train been dealt with, and even before some of the connecting traffic has been detached, the corresponding up train, due at 12.19 a.m., has to be dealt with at No. 4 platform, with similar complexities.

In addition to its traffic importance,



CREWE NORTH JUNCTIONS.

Showing North Junction box, suspension footbridge from station, and junctions towards Chester, Liverpool, the North and Manchester.

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Crewe station has staff associated with other departments. Thus, attached to the Locomotive Running Department are engine arrangers and inspectors, in view of the large numbers of trains which change engines and the numerous locomotives working trains to or from Crewe. Similarly, the Carriage and Wagon Department has a staff. Further, although there is no longer a special North Staffordshire stationmaster and staff, the Great Western Railway Company has an agent at Crewe, with his office staff and porters for handling purely Great Western traffic. The Telegraph Department is another very important one. The main telegraph office is on No. 5 platform, but there are sub-offices between platforms Nos. 1 and 2 and on No. 4 platform. A large business is done, as the office has to handle the public telegraph service as well as that of the railway company.

On an ordinary day Crewe deals with about 500 booked passenger trains, approximately equally divided in each direction. At week-ends in the summer the total may be more than 600, and, at times, 700 are handled in the course of 24 hours. It is not, however, so much the number of trains as that passenger interchange and luggage transfer are involved to so great an extent, together with the fact that so many of the terminating or commencing trains convey through vehicles, and shunting, breaking-up or re-making of trains, and changing of engines, are necessitated on so large a scale. Crewe is, of course, a 24-hour station, in that traffic is passing almost continuously, though with intervals, even between 12 midnight and 5 a.m. A special feature of the traffic is the frequency with which trains are divided or combined, and the extent to which through vehicles are attached or detached. Consequently, several shunting engines are practically continuously at work. In advance of most of the principal main-line services, or, as is frequently the case, groups of such trains, there are usually feeding trains arriving from various routes, either connecting express or calling at intermediate stations on the respective routes, while after the expresses have left there are corresponding distributing trains, some of the feeding or distributing trains conveying through vehicles to be attached to or detached from the through expresses.

Space will not permit of detailed consideration of all or many of these combinations of trains, but a few notes in regard to some of those of particular interest may be given. Thus, in advance of the 10 a.m. from Euston, due at Crewe in No. 1 platform, a Birmingham train, due in No. 2 platform at 12.24 p.m., brings with it its own Manchester and Liverpool coaches and a through carriage from Birmingham to Glasgow. There are several other trains arriving at Crewe in advance of the express, though the distributing trains behind are mostly kept back until the 10.30 a.m. from Euston has been dealt with at No. 2 platform. When American specials for Liverpool (Riverside) are run, these trains usually travel in advance of the 10.30 a.m. from Euston, and, if several are running, of the 10 a.m. also.

At 4.10 p.m. a train from Bristol arrives, including, together with portions for Liverpool and Manchester and a van for Leeds, a through vehicle from Bristol to Glasgow. Incidentally, the Liverpool portion takes on coaches from the 2.50 p.m. from Birmingham. At 4.35 p.m. the 1.30 p.m. from Euston is due at No. 1 platform, the Glasgow and Edinburgh portion taking on the through coach from Bristol just mentioned, while at 4.50 p.m. the Aberdeen portion takes with it vehicles for Whitehaven, Carnforth, and Preston.

At 5.26 p.m. arrives the train from Willesden Junction by which the through coaches from Eastbourne and Ramsgate to Liverpool and Manchester are brought. Ten minutes behind it comes the 2.35 p.m. from Euston, and the two trains are combined to form Liverpool, Manchester, and Birkenhead trains, leaving, respectively at 5.30, 5.40, and 5.48 p.m. A van from Euston to Fleetwood is also taken on by the 5.50 p.m. from Crewe to Windermere. The Bristol–Liverpool train, due at 8.5 p.m. in No. 2 platform, includes Manchester and Liverpool portions. At 8.22 p.m. the 5.20 p.m. Euston–Fleetwood boat express is dealt with, this including Fleetwood, Barrow, Birkenhead, and New Brighton portions. On Fridays this train usually runs in two parts, the first for Fleetwood only, and the second for the other destinations, with, in addition, a restaurant car for Chester.

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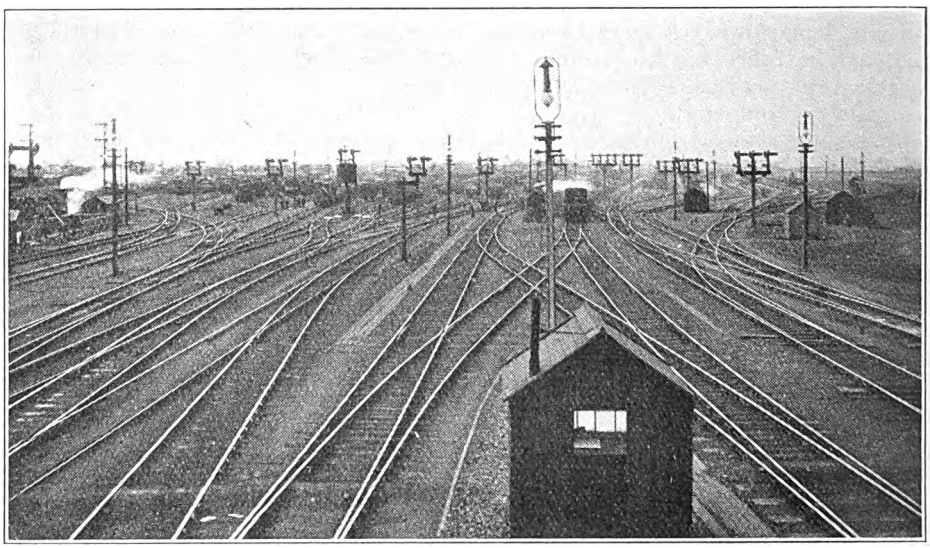
It is, however, in connection with the night trains that Crewe is specially interesting. At 9.55 p.m. a train from Birmingham brings vehicles for Newcastle, Perth, Chester, and Bangor. At 10.5 p.m. the 6.30 p.m. from Euston to Holyhead is dealt with, while at 10.59 p.m. the 7.30 p.m. Highland sleeping car train arrives at No. 2 platform. Close behind it is the first of the trains associated with the 8.30 p.m. postal train from Euston. This is the one due from Bristol at 11.18 p.m., which includes a postal van for Crewe and through carriages for Liverpool, Manchester, and Glasgow. At 11.30 p.m. arrives a train from Swansea, with vehicles for York, Newcastle, and Manchester. Three minutes behind this comes a Birmingham train conveying through carriages and postal vehicles for Holyhead, Glasgow, Edinburgh, and Perth. At 11.35 p.m. the mail train from Stoke-on-Trent is due, and at 11.44 p.m. the postal train itself, the 8.30 p.m. from Euston. This includes vans for Liverpool, Manchester, Preston, Stranraer, Aberdeen, and Glasgow. After detaching Manchester and Liverpool portions, it attaches vans for Glasgow and Edinburgh off the 10.15 p.m. from Birmingham. At 11.58 p.m. the 8.45 p.m. from Euston is due at No. 1 platform, this being the Irish mail train. The various departures associated with these trains may be summarised thus :—

11.57 p.m.	.. Postal train for the North.
12. 8 a.m.	.. Irish and North Wales mail.
12. 8 a.m.	.. Liverpool.
12.30 a.m.	.. Leeds, York, Newcastle, &c.
12.40 a.m.	.. Manchester.

Incidentally, the 12.30 a.m., among its various vehicles, includes a sausage van from Tipton to Newcastle, and postal vehicles from Shrewsbury to York, while the 12.40 a.m. takes forward vehicles from Pwllheli, Holyhead, Penzance, London, Hereford, Aberystwyth, Swansea and Pembroke Dock.

At 12.42 a.m. the 9.20 p.m. from Euston is due at No. 1 platform, the Glasgow portion leaving at 12.50 a.m., and taking vehicles from Plymouth to Glasgow, and a van for Perth from Birmingham, while Windermere, Whitehaven and Preston vans leave at 1.35 a.m. Between 1.5 and 1.20 a.m. the 9.30 p.m. from Euston to Scotland is dealt with at No. 1 platform. At 1.35 a.m. a Windermere train leaves with vans off trains already mentioned. Between 1.49 and 1.54 a.m. the 11 p.m. from Euston to Manchester, with newspapers and conveying vans for Seacombe, Bangor and Liverpool, occupies No. 1 platform, and at 2.6-2.9 a.m. the 11.5 p.m. from Euston



GENERAL VIEW IN SORTING SIDINGS.

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to Aberdeen, Edinburgh and Dundee, with vans for Southport and Whitehaven, is dealt with at No. 2 platform. A parcels train, due at 2.10 a.m., occupies No. 1 platform until 3.31 a.m., by which time it has sent off portions in various directions and attached others, so that an entirely new series of trains is constituted in combination with the 10.50 p.m. from Euston, due at Crewe at 2.26 a.m. and leaving for Manchester at 2.55 a.m. At 2.57–3.7 a.m. the 11.45 p.m. from Euston to Glasgow occupies No. 3 platform, and at 3.23–3.39 the 12.25 a.m. from Euston to Liverpool occupies No. 2 platform. This includes a news van for Leeds and vehicles for Manchester, leaving at 3.45 a.m., and a news van for Preston due away at 3.31 a.m. At 3.45 a.m. comes in a parcels train from Penzance, with vans for Carlisle, Manchester and Leeds, while at 4 a.m. No. 2 platform receives a train from Cardiff, Plymouth, Penzance and Bristol, with sections for Liverpool and Manchester. At 4.15 a.m. a Holyhead parcels train leaves.

In the up direction there are corresponding trains, though not always actual equivalents, in that sections of composite trains are sometimes differently combined. There is, however, a general similarity, and there is no need to consider them in detail.

Notwithstanding its extreme importance as a connection and transfer centre, there are a few trains which do not stop at Crewe, and these take No. 1 M.L. (the through line outside No. 1), No. 2 M.L. (the through line opposite No. 2), or No. 5 M.L. (parallel to No. 5), according to direction, or else use one of the platform lines. As these trains possess considerable interest, they may be set forth together with some of the special trains running during summer months, and the standard and conditional trains arranged for American boat specials to Liverpool (Riverside) in the down direction, as follows :—

DOWN.

Pass.	Line.		Description.
11.55	2 M.L.	S.O.	Birmingham to Blackpool.
12.27	2 M.L	S.O.	Conditional riverside boat train.
12.45	2 M.L.	F.O.	Euston (9.20 a.m.)–Scotland period excursion.
1.17	1 M.L.	S.O.	Dudley Port-Llandudno.
1.20	1 M.L.	F.O.	Euston (9.45 a.m.)–Llandudno period excursion.
1.40	2 M.L.		Euston (10.40 a.m.)–Manchester express.
1.50	2 M.L.		Euston (11 a.m.)–American Boat Special.
2.10	1 M.L.		Euston (11.10 a.m.)–North Wales Express.
2.23	1 M.L.		Birmingham – Llandudno Express.
2.36	2 M.L.		11.35 a.m. ex Euston.
3.47	1 M.L.		Coventry – Llandudno Train.
4.15	2 M.L.	F.O.	Stafford – Llandudno Period Excursion.
5.45	2 M.L.	S.O.	Torquay – Manchester Express.
8.45	2 M.L.		Euston (5.55 p.m.)–Liverpool Express.
8.55	2 M.L.		Euston (6.5 p.m.)–Manchester Express.
11.51	1 M.L.		First part of Irish Boat Train when divided.

UP.

(American Boat Trains not Scheduled.)

10.13	5 M.L.	S.O.	Manchester – Paignton Express.
10.29	5 M.L.		Manchester (9.45 a.m.)–Euston Express.
11.12	5 M.L.	F.O.	Manchester – Cardiff Period Excursion.
11.54	6	F.O.	Manchester – Euston Period Excursion.
1.52	5 M.L.		North Wales–Euston Express.
2. 3 2.12	5 M.L.		Llandudno-Birm'gham Express.
4. 4	6	S.O.	Rhyl-Stoke Express.
10.28	5 M.L.	F.O.	Manchester and Colne to West of England.

S.O. = Saturdays only.
F.O. = Fridays only.

In several instances the special and excursion trains indicated run only during part of the season, or times are modified at different dates, but the foregoing will suffice to indicate the general characteristics of this phase of Crewe's traffic.

It will be noted that several of the season excursion trains—that is, the regularly advertised period excursions—are included among the non-stops ; also certain trains, such as those between Birmingham and Blackpool or Llandudno, and the North Staffordshire–North Wales trains. There are, however, far more of these trains which call at Crewe. Indeed, on Saturday mornings there is quite a sequence of period

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MR. T. TRAVERS, STATIONMASTER, CREWE, L.M.S.R.

excursions trains, mostly occupying a platform for 10 minutes or so and changing engines. Thus, after Friday midnight there are such down trains at 12.51–1.0 (No. 2), 1.30–1.36 (No. 1), 2.15–2.25 (No. 3), 2.35–2.43 (No. 3), 3.15–3.25 (No. 1), 3.41–3.48 (No. 3), 3.51–3.58 (No. 2), 4.7–4.15 (No. 1), 4.12–4.20 (No. 3), 5.20, 5.35, 5.50–5.45, 5.50, 5.57, 6.7 (Nos. 2 and 3). This last series represents a recombination of several trains. Later on and on specific dates various day excursions are also dealt with. Other season excursions are run on Fridays, these including the following: 2.17–2.22 (No. 3), 2.25–2.29 (No. 2), 4.50–4.57 (No. 2), 5.12–5.20 (No. 2 M.L., stop for locomotive purposes only), 5.55–6.0 (No. 2), 6.0–6.5 (No. 2 M.L., stop for locomotive purposes only), 6.5–6.12 (No. 2), and 10.15–10.25 (No. 1).

In the opposite direction the following trains may be noted:—*Saturday mornings*: 1.35–1.55 (No. 5), 2.5–2.15 (No. 4), 2.19–2.25 (No. 5), 2.59–3.5, 3.7–3.15 (the last two use any platform convenient). *Fridays*: 11.40–11.50 (No. 3), 12.0–12.15 (No. 4), 12.10–12.25 (No. 6), 12.16–12.30 (No. 5), 4.24–4.32 (No. 5), 6.0–6.10 (No. 5), 9.45–9.55 (No. 5), 10.26–10.35 (No. 5), 11.19–11.30 (No. 5).

Besides these there are stopping or non-stopping parcels, luggage in advance, horse-box, empty stock, newspaper, fish, milk, cattle, through goods and mineral and ordinary goods and mineral trains to or from the North Staffordshire section, so that the 500–700 trains dealt with at Crewe station introduce almost every imaginable phase of railway working, with combination and division of trains and transfer of passengers, luggage, mails, parcels, &c., on a scale which is almost unequalled anywhere. As, moreover, a large proportion of the through trains change engines, while all those which start from or terminate at Crewe involve the release and attaching of engines (frequently turntable and engine shed journeys also), the signalling, regulating and directing staffs have an almost continuously heavy demand upon them.

Even on Sundays, after allowing for the evening and night working of the Sunday morning and evening long-distance trains, which correspond to some extent with those operated on week-days, there is a fair total of trains to be manipulated, while a usual addition is a wide variety of interchange traffic due to the Sunday travels of theatrical parties, their through carriages and vans centring upon Crewe in large numbers, and from and to all routes and widely separated places.

Necessarily, a station such as Crewe requires the services of a considerable staff, and Mr. Travers, stationmaster, is assisted by three assistant stationmasters, Messrs. E. Barnett, C. J. Cowley and J. Orme, four chief inspectors, seven inspectors, and three parcels inspectors, together with about 320 men of various traffic grades. The booking offices are under Mr. Burrows, passenger agent, who also deals with parcels traffic addressed to or despatched from Crewe. All transfer

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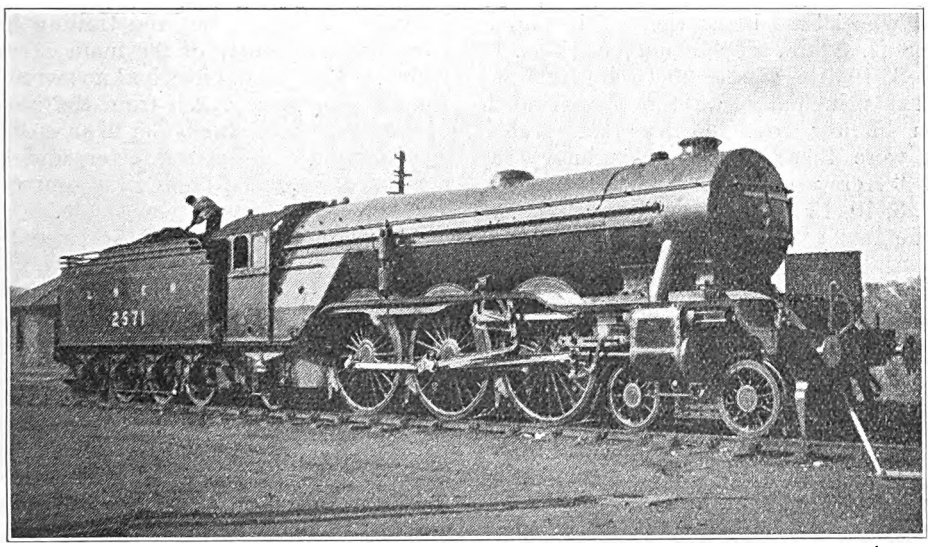
and through parcels traffic is, however, dealt with by Mr. Travers' staff. The telegraph staff, numbering 79, together with a telegraph clerk in each of the principal signal-boxes, is under Mr. Holden.

Mr. Thomas Travers has spent the whole of his official career at Crewe, attached to the station of which he now has charge. Entered service at Crewe station, July, 1887, as ground pointsman; took up platform porter duty, January, 1888; made foreman, 1896; inspector, 1902; chief inspector, 1907; night stationmaster, 1909; assistant stationmaster, 1912; stationmaster, 1919.

L.N.E. "PACIFIC" LOCOMOTIVE No. 2571.



We are indebted to Mr. R. D. Stephen for the photograph reproduced above, showing one of the latest "Pacific" locomotives placed in service on the London and North Eastern Railway. The photograph was taken at Haymarket Sheds, Edinburgh. The engine was one of those fitted with the Westinghouse brake and intended for use on the North British section, though similar engines already in service had vacuum brake apparatus. It will be noticed that the Westinghouse pump is placed on the footplate alongside the boiler.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT SOUTHERN AND WESTERN RAILWAY IRELAND. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

No more 2-4-0 engines were built after 1876, and in 1877 Mr. McDonnell modified the design of the subsequent small passenger engines with 5 ft. 8 in. wheels and 16 in. by 20 in. cylinders by substituting a leading bogie with 3 ft. wheels, the total wheel base being thereby increased to 18 ft. 8¾ in. These engines, Nos. 2, 5 to 8, 10, 13, 15 and 43 to 46, were intended principally for the long branch from Mallow to Killarney and Tralee, and were therefore generally known as the "Kerry engines." The last four, Nos. 8, 10, 13 and 15, were built in 1880.

The most interesting detail of this design was the bogie, which was the first example in the British Isles of the American pendulum or swing-link type. Mr. McDonnell, who introduced the design, took it with him to the North Eastern Railway, where he employed it in 1884. Sir John Aspinall, who succeeded him on the Great Southern and Western, afterwards used this bogie from 1887 on the Lancashire and Yorkshire, and finally Mr. Ivatt brought it over to the Great Northern in 1896.

McDonnell also introduced new types of tank engines. The passenger tank engines were of the 0-4-4 type with tanks at the back over the trailing bogie. The first two, Nos. 33 and 34, built in Inchicore in 1869-1870, were unique in that they were the first engines to be constructed on what was known as the "Single Fairlie" system, that is, with one steam bogie in front and an ordinary carrying bogie at the back. The latter was of the Adams' sliding type. The front or steam bogie carried the cylinders, which were inside, and the motion. The cylinders were 15 in. by 20 in., and the four-coupled wheels had a diameter of 5 ft. 7½ in. The boiler was attached to a cradle with a flat face and bogie pivot on its under side, the whole being secured to the main carrying frames, which not only rested on the bogie centre plate, but were also supported at each side by india-rubber check springs. The object of the arrangement was to enable the main carrying frame and steam bogie to tilt laterally in unison, but the trailing bogie tilted independently of the main carrying frame. The steam pipes had no swivelling joint; they were taken from the outside of the dome round the boiler to an ordinary tee junction beneath the latter, and their elasticity was relied upon to accommodate the movement of the steam bogie.

Only two engines of this type were built, and the Fairlie steam bogie was not perpetuated. Both engines were broken up about 1891 or 1892. The later 0-4-4 tank engines Nos. 27, 28, 30 to 32, 35 to 38, 41 and 42, built by McDonnell at Inchicore from 1870 to 1874, were of very similar dimensions, but the coupled axles were carried in the main frames. The design of the trailing bogie was also altered, and, instead of the usual pattern with inside axleboxes, as in engines 33 and 34, the later engines from 1874 onwards had bogies with outside frames and axleboxes with independent plate springs for each wheel.

In 1879 three similar engines, Nos. 29, 39 and 40, were built. In these the cylinders were enlarged to 16 in. by 20 in. The type, with a few variations in detail, was continued by Sir John Aspinall, and twenty more, Nos. 47 to 51 and 70 to 84, came out from 1883 to 1887. Most of the latter are at work, but all the earlier 15 in. by 20 in. engines were broken up before the year 1900. The Aspinall engines had a shorter wheel base than the three built by McDonnell in 1879, and the capacity of the water tanks was reduced from 1,200 to about 1,050 gallons, but the

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amount of coal carried was somewhat increased.

The majority of the above engines were employed between Cork and Queenstown, though a few were stationed at Inchicore for work between Dublin and Kildare, and one ran regularly between the Dublin stations at Kingsbridge and North Wall.

The last of McDonnell's engines to be mentioned are noteworthy in that they were the first 0-6-4 tank engines in the British Isles, except two small locomotives on the North Wales Narrow Gauge Railway. The first two, 201 and 202, built at Inchicore in 1876, had back tanks above the trailing bogies. The bogies had outside bearings. The cylinders were 18 in. by 24 in., and the coupled wheels of cast iron were 4 ft. 6½ in. diameter. Pressure, 140 lb. In 1879–1880, four more 0-6-4 tank engines, Nos. 203 to 206, were constructed, which differed from the two previous engines in having side instead of back tanks. At a later date 201 and 202 were converted to side tank engines, but in 1895 these were withdrawn from their regular duties, and put to departmental work, after which they bore the names "Negro" and "Jumbo."

These engines were used at Dublin and Cork for heavy train marshalling. At Dublin the goods trains from the west for North Wall were then taken by them from Island Bridge Junction, near Kingsbridge, round the west of the city to Drumcondra Junction, whence they ran on to the Midland Great Western Railway, and over the Liffey Branch railway of the latter, and terminated at the London and North Western station at North Wall. The gradients and curves on this line are severe.

At Cork, where some of these tank engines were employed, the number of wagons which could be taken up through the tunnel, where the gradient is 1 in 60, was strictly limited. At the top of the bank there were extensive marshalling sidings where the tank engines sorted the trains in readiness for the main line engines to take charge.

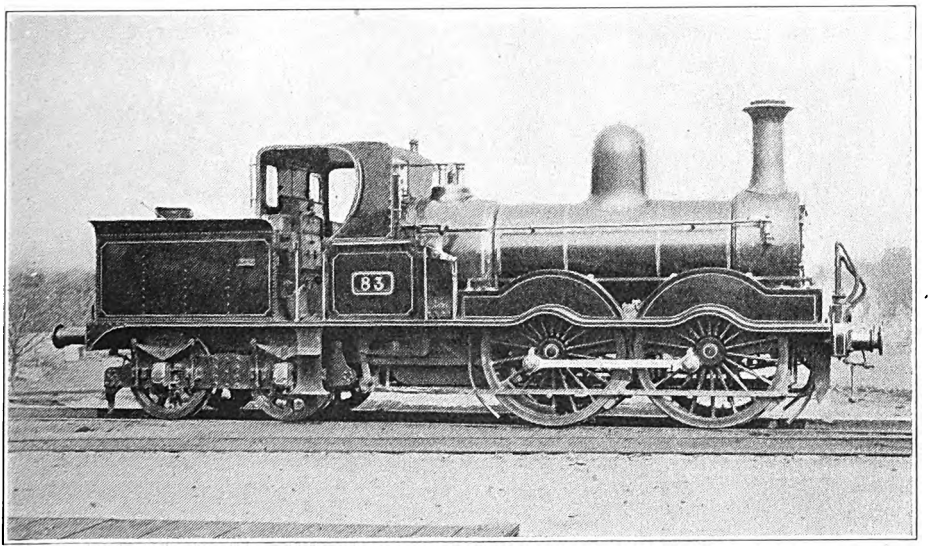

Photo.] [*Loco. Publishing Co. Ltd.*

0-4-4 TANK ENGINE No. 83 (1884).

Coupled wheels 5 ft. 7 in. diam. Cylinders 16 in. by 20 in.

The total weight of the 0-6-4 side tank engines in working order was 51¼ tons, of which nearly 15½ tons were carried on the bogie. This large proportion of weight not available for adhesion is a serious fault in engines intended for banking and heavy shunting. In the first two engines, which had back tanks only, the proportion was still more unfavourable. Another fault in engines with a long wheel

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base of this type, when used in shunting yards and over sections with very sharp curves, is that the long leverage of the lateral pull of the controlling force of the bogie greatly increases the flange pressure of the leading coupled wheels against the outer rail of the curve, to the detriment of both tyre flanges and rails.

In 1887 the engines of this class were replaced at Cork by new 0-6-0 tank engines.

The engines of the Great Southern and Western Railway were painted dark olive green, picked out with black panels, and red and light green lines. The frames were of a red brown colour. These colours were retained until about 1901–2, when black was adopted.

The engine number-plates used by McDonnell from 1866 were of cast iron, of almost the same pattern as those of the London and North Western Railway. Whether Mr. Webb, on the latter railway, copied McDonnell's plates, when the former introduced them in 1873, I do not know, but it is certain that the Irish railway was the first in the field by several years. After McDonnell's departure, the cast-iron number-plates were discarded in 1883 for white metal ones of similar design.

The recorded weights of the six-wheeled main-line carriages in 1875 were as follows :—

	tons.	cwt.
First class	10	3
Second class.. ..	9	8
Third class	9	10
P.O. vans	10	0
Guards' vans ..	9	12

Whether the colour in the early days was different, I do not know, but from the time that I first saw them during the late 'eighties, they were painted dark purple, lined out with yellow.

Brief particulars of the train timing in 1864 and 1875 have been mentioned. In 1880 the limited mail took 25 minutes less from Dublin to Cork than in 1864. It arrived at Cork at 2 p.m. as before, but left Kingsbridge at 9.0 a.m., instead of 8.35 a.m., having been brought round from North Wall, where it left at 8.0 a.m. But it had to make seven stops between Dublin and Cork, of which those at Portarlington and Mallow were of five minutes' duration, and that at Limerick Junction lasted ten mins. Altogether the total time occupied by stoppages amounted to 32 mins. The average running speed over the whole journey amounted, therefore, to 37 m.p.h.

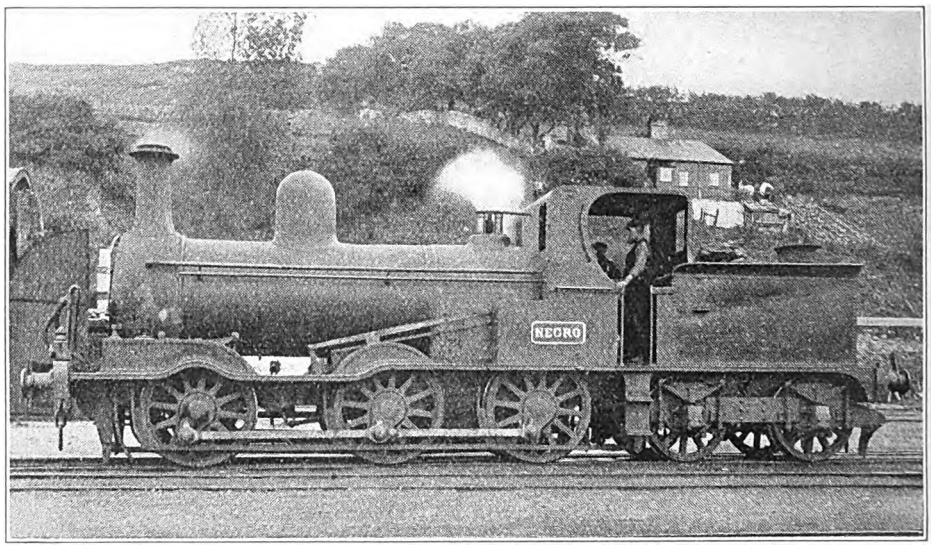

Photo.] [*Loco. Publishing Co. Ltd.*

0-6-4 TANK ENGINE No. 201 ("NEGRO").

Built at Inchicore, 1876. Coupled wheels 4 ft. 6 in. diam. Cylinders 18 in. by 24 in.

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Of the only other down main line trains of importance, one was the "express" at 10.15 a.m. from Dublin, which took 6 hours 20 mins. to Cork. Though carefully recorded as an express, it was in reality only a moderately fast train to Ballybrophy, after which it stopped at all stations. The other was the so-called "night mail" at 7.45 p.m. from Dublin, which landed its passengers in Cork at 2 a.m.

The up limited mail, which departed from Queenstown at 11.30 a.m. and Cork at 12.30 p.m., was 10 mins. slower between Cork and Dublin than the corresponding down train, although the stoppages accounted for 27 minutes, or 5 mins. less.

The best speeds were those of the morning down mail, which ran from Dublin to Kildare (30¼ miles) at 38·6 m.p.h., from Ballybrophy to Limerick Junction, 40½ miles, at 39·2 m.p.h., and thence to Mallow, 37¼ miles in the even hour. The up mail was slightly slower.

The above trains were worked until the end of 1883 by the 2-4-0 engines of the 56 to 65 series, but in the latter year Mr. (now Sir John) Aspinall built at Inchicore a class of 4-4-0 engines for this service. He retained the 17 in. by 22 in. cylinders and the 6 ft. 7 in. coupled wheels of the 64 class. The bogie was of the pendulum link type with 3 ft. wheels. Total heating surface, 931 sq. ft.; total weight in working order, 36 tons 8 cwt. There were twenty of these engines, of which only Nos. 52 to 55 (1883) and Nos. 9 and 16 (1886) had been built before Sir John's departure for the Lancashire and Yorkshire Railways. The remainder were constructed during Mr. Ivatt's term of office, as follows:—Nos. 97 and 98 (1887), 4, 11, 14, 18, and 56 to 59 (1888), and finally Nos. 1, 3, 12, and 20 (1890). These engines retained the raised firebox casings as in McDonnell's engines, but the driving splashers, which in McDonnell's engines were of the "paddlebox" pattern, were completely closed in.

It should be added that of this class only the first four, Nos. 52 to 55, did much work on the mail trains, since in 1885 a larger class was built for this purpose. The later engines of the 52 class were used on the slower main line trains, and on the Killarney service.

The new (1885) type of 4-4-0 engine, which was considerably larger and more powerful, also owed its origin to Sir John Aspinall. The cylinders are 18 in. by 24 in., coupled wheels 6 ft. 7 in. diameter. The wheelbase between the coupled axles is 8 ft. 3 in., or 6 in. longer than that of the preceding engines. Total wheelbase 20 ft. 4⅞ in. The firebox casing is flush with the boiler barrel. The pressure of the first nine engines was stated to have originally been 140 lb., but in the later engines was raised to 150 lb. Total heating surface 1,051½ sq. ft. Total weight in working order 39¼ tons, of which 25¾ tons were available for adhesion. Large tenders holding 2,730 gallons of water, and with a coal capacity of 5½ tons, were provided. There were fifteen of the class, of which Nos. 93 to 96 were built in 1885, 85 to 89 in 1886, 60 to 63 in 1891, and 64 and 65 in 1895. Engine 87 was sent to the Manchester Exhibition of 1887. The later engines were built during Mr. Ivatt's time.

The automatic vacuum brake in use on the railway differs in several respects from that used in Great Britain, and was originally due to Sir John Aspinall, who patented it in 1878. In one of my articles on the Midland Railway in the RAILWAY MAGAZINE of September, 1919, I made some comments on the "battle of the brakes" on that line during the 1873-1889 period, and in a letter to me Sir John then very kindly gave the history of the vacuum brake on the Great Southern and Western of Ireland. From this letter, with his permission, I quote the following:—

"The Smith's simple vacuum brake was fitted on a Great Southern and Western train at Inchicore when I had charge of those works about 1876-7. This brake had circular corrugated india-rubber cylinders, which were open to the objection that as they collapsed like an accordion the effective pull became less on account of the area under pressure being reduced by reason of the folding up of the corrugations. Later on we used which was known as the Hardy* cylinder,

* Hardy was one of the earliest pioneers in continuous brakes. He was an Englishman domiciled in Austria, who together with Smith in America and this country, produced the first vacuum brakes. The Hardy automatic vacuum brake is in use on all the Austrian railways.

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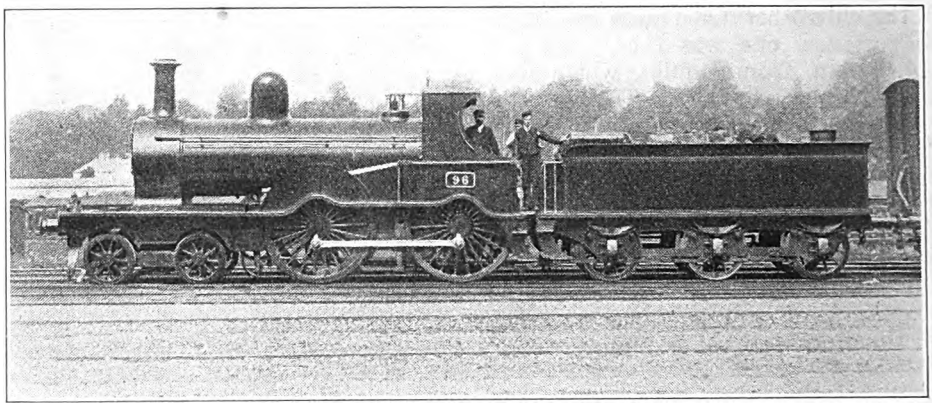

4-4-0 LOCOMOTIVE BUILT AT INCHICORE IN 1885.

Designed by Sir John Aspinall. Coupled wheels 6 ft. 7 in. diam. Cylinders 18 in. by 24 in.

which was fitted with a dished leather diaphragm, but the brake still remained non-automatic. The diaphragms were made in Austria, and were very flexible and absolutely air-tight. Later on, owing to the difficulty in getting diaphragms of leather made in England, rubber was substituted."

Here it may be pointed out that in the old non-automatic brake the air was drawn out by the ejector from the upper portion of the brake cylinder, and this action caused the brakes to be applied. The Smith "cylinder" A (see diagram) was in the form of a collapsible "concertina," and when the vacuum was produced inside it, the bottom cover, to which the piston rod was attached outside, was lifted, thus actuating the brake levers. The air was drawn out through a hole 3, and the india-rubber collapsible sides are denoted by 6.

The Hardy cylinder, which was entirely of metal, is shown at B. The outer circular edge of the flexible diaphragm 1 was secured between the flanges of the two halves of the cylinder, and was strengthened at the bottom by metal plates. The bottom of the cylinder was open at the large air spaces 2. As the air was exhausted by the ejector through hole 3 above the diaphragm, the latter was pushed upwards by the atmospheric pressure acting through the openings 2.

Sir John Aspinall's letter continues: "About this time I thought that the brake might be made automatic in a very simple way by closing up the bottom cover, and attaching to it a flexible corrugated sleeve, the lower part of which was attached to the pull rod. This turned out to be a great success, and the Great Southern and Western trains were so fitted.

"The first train to be fitted in England was one on the Great Northern, the experiment being made somewhere between Doncaster and Lincoln. The use of this sleeve spread to a number of Companies, and when I left the Great Southern and Western Railway in 1886, and came back to England, I found large numbers in use on the Lancashire and Yorkshire and London and North Western railways."

This arrangement, which was subsequently adopted and for a long time used by the Vacuum Brake Company, is shown in diagram C. The air was exhausted through 3 from the upper part of the cylinder above the diaphragm 1, but as the bottom of the cylinder is closed there is no atmospheric pressure to push the diaphragm upwards and apply the brake until air is admitted by the driver and entered through the opening 4 on the under side of the diaphragm. The flexible sleeve 5 prevented air from leaking from outside past the piston rod to the under side of the diaphragm. The small ejector maintained a constant vacuum in the spaces both above and below the diaphragm 1, and if the train pipe, which was connected with 4, became uncoupled or was broken, the air rushed in through 4 and applied the brake.

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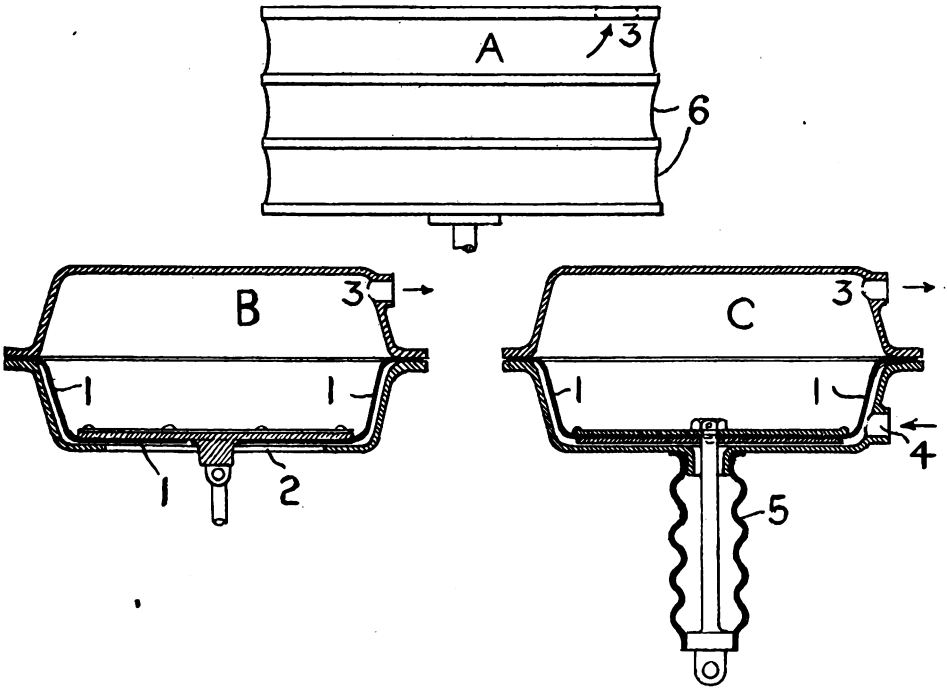
But in one important respect the general arrangement of Sir John Aspinall's brake, as applied on the G.S. & W.R., differed from that in use on other railways. In the Vacuum Brake Company's later arrangements the outlet 3 was connected to a reservoir, which had a connection through an automatic valve with the main train pipe, and the train pipe served both as the passage for the air exhausted by the ejector through 3, and for the air entering through 4 when the brake was applied. There was, therefore, only one train pipe coupling between the engine tender and each carriage. In the Great Southern and Western system two pipes extended from the engine throughout the train. Of these the larger 2-in. pipe was connected at 4 to the bottom of the brake cylinder. The smaller 1½-in. pipe was connected at 3 to the space above the diaphragm. In the original Aspinall design there was a connection between these pipes outside the brake cylinder through a patent double-beat valve, particulars of which and of other parts of the apparatus would be too complicated for description here. The arrangement was afterwards modified, I believe by Mr. Ivatt, still retaining the two train pipes. Briefly stated, it need only be said that the smaller pipe was always in communication with the ejector, so that, when the brake was on, any leakage of air into the pipe or into the top of the cylinders was at once made good by the action of the small ejector, without having to recreate a vacuum beneath the diaphragm, thereby releasing the brake.

Although the automatic brake designed by Sir John Aspinall was in use during some years on a train between Dublin and Kilkenny, the non-automatic brake was the one employed by the Company until about 1890 or 1891, when automatic brakes became compulsory.

Before leaving the subject of continuous brakes, I should like to place on record that the development of the automatic vacuum brake to its present state of efficiency owes much to the genius of Sir John Aspinall—in fact, more than is generally known. Apart from the improved Hardy cylinder with diaphragm, described above, which was used for a long time on many railways, the automatic



DEVELOPMENT OF THE VACUUM BRAKE CYLINDER.

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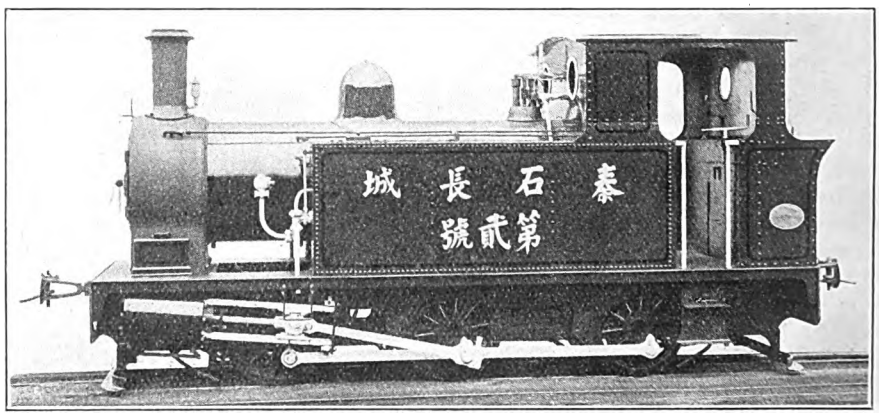
guard's van valve was invented by him in 1879 on the Great Southern and Western Railway. This valve was similar in principle to the one now in use in every vacuum fitted van in the kingdom, the principal difference being that to open the valve by hand and apply the brake, the handle was lifted instead of depressed, as is now done. Other slight differences are merely matters of detailed design. How many railwaymen are there who are acquainted with this fact, although the inventor is still with us?

The tank engine *Negro*, originally 201, as shown in the illustration, had the additional side tanks removed when the engine was put to departmental work and was, therefore, reconverted to its original design.

(*To be continued.*)

BRITISH TANK ENGINES FOR CHINA.



THE 0-6-0 tank locomotive illustrated herewith forms one of an order for several recently completed by W. G. Bagnall Limited, of Stafford, for the Chang Cheng Railway of China, the gauge of which is 3 ft. 6 in. As seen, outside cylinders are employed. These are 12 in. diameter by 16½ in. stroke, and steam is distributed to them by Stephenson link motion inside the frames. The wheels have a diameter on tread of 2 ft. 9¼ in., and the wheelbase is 10 ft. The wheels have cast steel centres with tyres 5 in. wide and 2¼ in. thick. The boiler barrel, which is formed of plates ⅜ in. thick, has a length of 7 ft. 6 in. and diameter of 2 ft. 11¼ in., whilst the firebox is 3 ft. 6¼ in. long by 2 ft. 10½ in. wide, both being outside dimensions. The inner firebox is of copper, and the boiler tubes, 92 in number and 1¾ in. outside diameter, are of brass. The total heating surface is 369·5 sq. ft., the tubes contributing 326·96 sq. ft. and the firebox 42·54 sq. ft. The grate area is 7·125 sq. ft. and working pressure of the boiler 150 lb. per sq. in.

The side tanks hold 550 gallons of water, and the bunker capacity is 35 cub. ft. In working order the engine weighs 19¾ tons. It develops 8,025 lb. tractive effort at 75 per cent. of the boiler pressure. The engines are of neat appearance and well finished. The footplate accommodation is very good.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

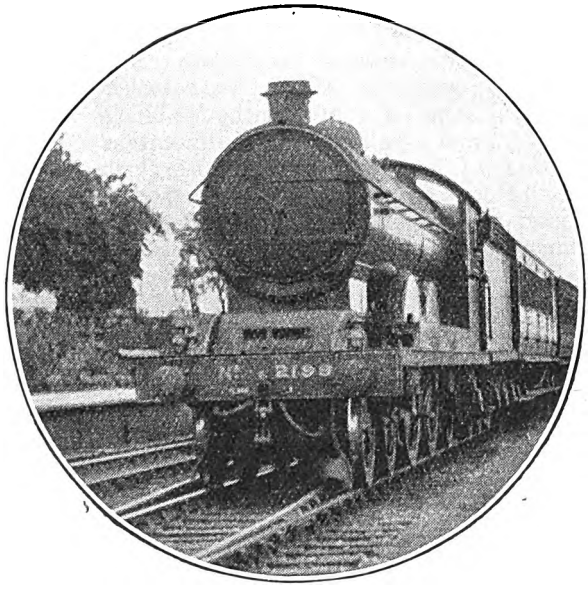

Photo.] [*H. Gordon Tidey.*

NEWCASTLE-CARDIFF EXPRESS PASSING BENINGBROUGH AT SPEED.

North Eastern Section 4-4-2 locomotive No. 2199, Class Z.

FURTHER letters continue to reach me in connection with the subject matter of my last two articles, and show that the comparison of the Gresley "Pacific" and Great Western "Castle" designs has attracted some attention. "Your reply in the March article," writes one correspondent, "is interesting, but not very conclusive"—for the simple reason that there is little comparative material as yet available on which to base a conclusive judgment. "There seems to be a good deal in what you say as to the preferences of locomotive men, and the traditions under which they have been brought up. But the British locomotive driver is becoming a more scientific individual, and he should be able to drive his engine in the most economical way, coupled with maximum efficiency."

Is my friend's contention in regard to the present-day driver over here altogether correct? Many British drivers of to-day have by their own unaided efforts acquired an expert knowledge of the locomotive without which many of the remarkable performances recorded from time to time in these columns could never have taken place. The locomotive engine, too, is certainly becoming a more scientific machine. But until our methods of recruiting and educating the driver are altered to correspond, say, with the French method, which includes definite technical training, and does not leave it entirely to a driver to pick up what he can about the theory of the locomotive during long years of cleaning and firing, I do not think we shall see a general advance in the direction indicated.

"The Gresley 'Pacific,'" my correspondent continues, "seems to me the only real advance in design that we have seen over here since the war. The fact that one of the leading railways of the United States is building a new three-cylinder 'Mountain' (4-8-2) type engine, in which the valve-motion is to be of the well-known Gresley type" (with two sets of Walschaert gear to operate the three piston-valves), "shows that America has learned something from Mr. Gresley. I believe that some fifteen American lines are to experiment with this type of engine. The American looks upon his locomotive as a dividend earner, and it has got to earn dividends; when it can no longer do so it is scrapped. I understand these new 4-8-2 engines are to replace two 'Pacifics' of the older type, and will work over very long mileages." This is undoubtedly the case. The new Canadian National 4-8-2 engines, for example,

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work 800-ton express passenger trains regularly over the 334 miles between Montreal and Toronto without being changed, and I believe it is the intention of the Est Company of France to use their new 'Mountain' type four-cylinder compound engines unchanged from Paris to Nancy, a distance of 219 miles.

"Why should not the Gresley 'Pacifics,'" my friend adds, "run through between King's Cross and Edinburgh? This is a system which America now finds economical, as an engine which is maintained over long periods at even temperatures is more efficient in its performance than one in which the fire has to be damped down after a comparatively short run. Moreover, with the wide firebox the fire can be kept clean over a long continuous run." There are, as a matter of fact, a number of lengthy "Pacific" turns on the East Coast route, such as King's Cross to York, 188 miles, Edinburgh to York, 204½ miles, and others; while it is frequently the practice to schedule an engine of this class for the round trip from London to York and back with only 40 minutes at York in which to turn round. The difficulty in carrying out the last-mentioned working last summer, when it was in force on the 10 a.m. down "Scotsman," and the return train due in London at 6.15 p.m., was in no way the fault of engines or crews, but the difficulty of ensuring a through road for the engines round the triangle afforded by the goods lines from the north to the south end of the station, which had to be traversed owing to there being no turntable at York big enough to take engines of this length.

There is, however, at least one advantage in some limitation of the length of run made by one locomotive, which operates particularly in the case of large and costly machines such as those to which reference is now being made. It is that of keeping the working of each engine in the hands of not more than two crews, which gives them more interest in the maintenance of the engine in good order than would otherwise be the case. Even with the lengthy London and North Eastern journeys just mentioned, it is found generally practicable so to work the "Pacific" engines. Another through engine working of recent institution relates to Great Western 4-6-0 engines, which are now being run without change over the 305 miles from Paddington to Penzance, and also from Shrewsbury to Newton Abbot. But a firebox of adequate size is an essential

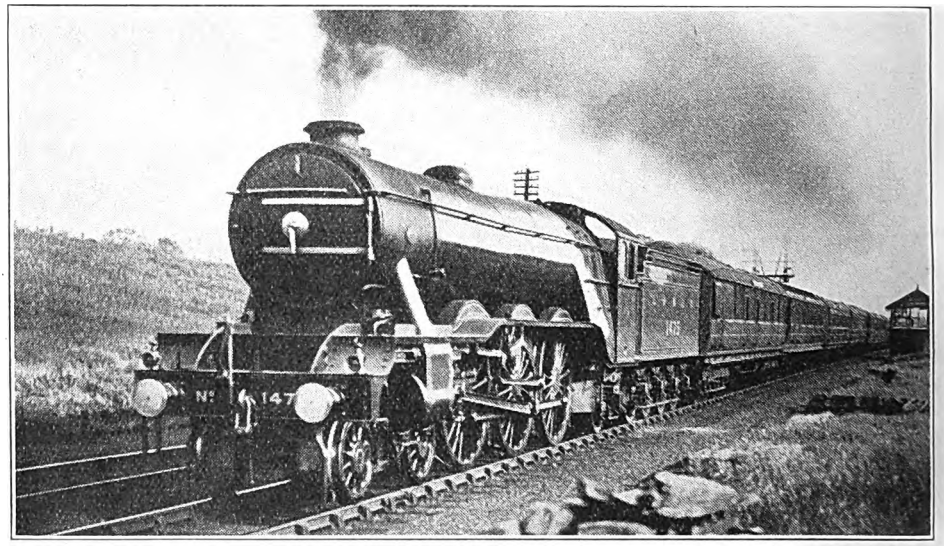

Photo.] [*W. J. Kohning.*

5.45 P.M. KING'S CROSS TO LEEDS AND BRADFORD EXPRESS PASSING HADLEY WOOD.

Gresley (G.N.) "Pacific" locomotive No. 1475.

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in the carrying out of such lengthy journeys.

"Theoretical efficiency," my friend concludes, "is all very well as the basis of design, but the proofs of actual efficiency of operation embody the varied considerations of rated load haulage and timekeeping—the first essentials—and then total engine hours available daily for traffic, maintenance costs, coal consumption, and—another important point—the type of coal that can be burned. I contend that with a low grade of fuel the Gresley 'Pacific' would beat the Collett 'Castle' hands down. While I much admire the Churchward-Collett product, which, no doubt, is at present well fulfilling the Great Western needs, the design hardly seems capable of much further expansion."

"I consider Mr. Gresley to be the leading locomotive engineer in this country, and, although he is bound by the British loading gauge restrictions, his design is capable of being expanded, while still keeping standardisation well within the picture. No doubt his 4-6-2 has all the London and North Eastern requirements well in hand, with, indeed, a good margin to spare, but I think I can see on the horizon the Gresley three-cylinder 'Mountain' type. Most people are now realising in this country (with the exception of one of our largest groups) what the rest of the locomotive world has long ago decided—that the locomotive of the largest size and power that may safely be put on the track, working well within its capacity and burning low-grade fuel, is the most efficient prime mover yet devised for railway operation."

My correspondent thus nails his colours to the mast in no uncertain fashion. His last contention I would not be so venturesome as to attempt to argue; I must leave it to the advocates of the internal-combustion engine, the turbo-condensing locomotive, and last, but not least, of electrical operation, to cross swords with him. But the question of the quality of fuel is one of considerable interest. It would be interesting to know what proportion of the wonderful performances so often recorded on the Great Western Railway is due to the employment of the best Welsh steam coal. If the boiler and firebox is one of the leading features, and perhaps *the* leading feature, from the design point of view, of the Gresley "Pacific," there is little doubt that the secret of Great Western locomotive work—and especially express

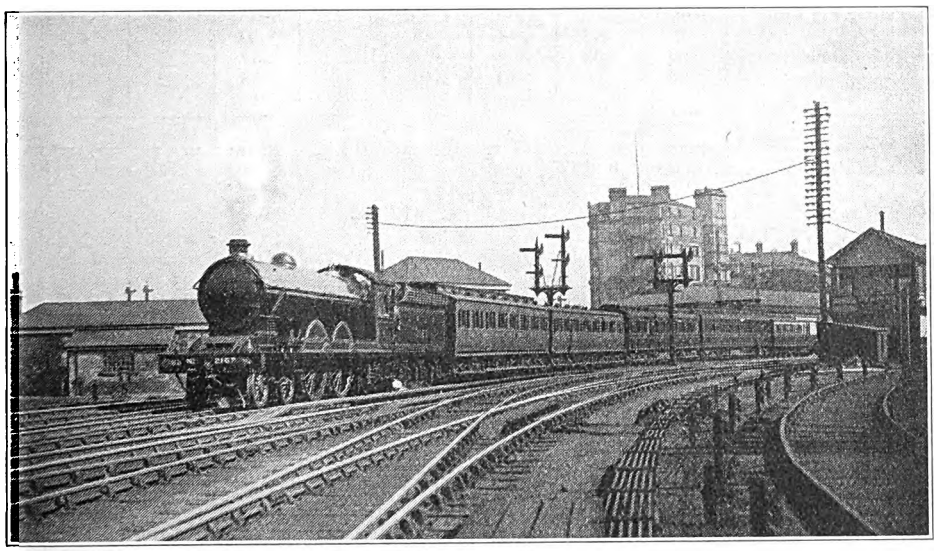

Photo.] **BARRY-NEWCASTLE EXPRESS LEAVING YORK.** [*H. Gordon Tidey.*

North Eastern Section 4-4-2 locomotive No. 2163, Class Z; G.W.R. coaches at rear.

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locomotive work—is to be found chiefly in the originality of the valve-setting, and the design of the Great Western front-end generally.

Incidentally, this enables me to answer the enquiry of another correspondent as to why working habitually at short cut-offs should tend to increase the costs of locomotive maintenance. The answer is that, with an average valve-setting, there is a proportionate tendency to increase back-pressure, although the exceptional length of lead and of valve-travel on Great Western engines would certainly reduce any such trouble to a minimum. But the point at issue is this: Would the blast arrangements of a Great Western "Castle" class 4-6-0 enable the engine to work with as proportionately high efficiency on a low-grade fuel as it does on high-grade fuels? Working with high-grade fuels I should imagine that the Gresley "Pacific," with its much sharper blast, would be the heavier engine of the two on coal, hauling, say, a 500-ton express; but I am inclined to agree with my correspondent that, if low-grade fuel were used, the "Pacific" would have a considerable advantage in steaming, and correspondingly in performance. These are very intriguing enquiries, and one longs to see the result of putting these matters directly to the test, as will have been done by the time these lines are in print. And what about a three-cylinder "Pacific," with a Gresley boiler and valve-motion, but the Great Western valve-travel and setting, and design of steam passages and smokebox? Such an engine should, indeed, challenge comparison, for both performance and efficiency, with anything else in the locomotive line the whole world over.

And now, in the realm of performance, the time has come for some more Southern Railway records, on the South Western section of that group. Of these I am indebted to correspondents for a

SOUTHERN RAILWAY (S.W. SECTION). WATERLOO-SALISBURY.

Distance.	Engine No.	753	755	741	432	Distance.	745	729	119	282
	,, Type	4-6-0	4-6-0	4-6-0	4-4-0		4-6-0	4-4-0	4-4-0	4-4-0
	Load (axles)	40	44	44	48		40	32	42	52
	,, (tons tare)	266	295	309	320		267	211	287	358
	,, (tons full)	280	310	330	340		285	225	305	390
Miles.		m. s.	m. s.	m. s.	m. s.	Miles.	m. s.	m. s.	m. s.	m. s.
0·0	Waterloo ..	0 00	0 00	0 00	0 00	83·5	89 00	92 48	94 23	109 24
							sigs.	sigs.	sigs.	sigs.
1·4	Vauxhall ..	3 20	*3 20	*3 45	3 31	82·1	85 00	89 12	89 09	98 13
								sigs.	sigs.	sigs.
3·9	Clapham Jc...	6 55	6 57	7 32	7 12	79·6	81 55	85 35	85 18	90 46
								sigs.		
7·3	Wimbledon ..	11 05	*10 55	11 44	11 22	76·2	78 25	81 10	81 07	86 25
			p.w.r.					sigs.	sigs.	sigs.
12·1	Surbiton ..	16 30	17 06	17 00	16 48	71 4	73 25	73 46	75 01	78 54
19·1	Weybridge ..	24 00	24 56	24 18	24 45	64 4	66 40	66 48	68 09	72 17
24·3	Woking ..	29 45	29 53	29 41	30 25	59·2	62 25	62 16	63 26	67 42
31·0	Mile-post 31 ..	38 45	36 53	*37 45	38 20	†55·5	†59 25	†59 18	†60 17	†64 14
										sigs.
33 2	Farnborough	41 25	39 06	40 09	40 40	50 3	54 40	54 25	55 15	57 40
42 2	Hook ..	51 30	—	49 32	—	41·3	46 40	46 10	46 47	49 23
47·7	Basingstoke ..	57 45	53 20	55 15	55 15	35 8	41 55	41 05	41 47	44 30
50·1	Worting Jc. ..	61 10	56 00	58 09	58 00	33·4	39 40	*38 53	39 35	42 11
55·4	Overton ..	68 05	*61 45	64 09	*64 00	28·1	33 55	33 18	33 21	36 33
60·9	Hurstbourne..	73 20	66 40	69 17	*69 10	22·6	27 30	27 18	28 32	30 24
66·3	Andover ..	78 05	71 21	73 51	73 40	17 2	22 15	22 00	23 20	24 59
72·5	Grateley ..	84 15	78 05	80 23	80 31	11·0	16 50	16 25	17 44	19 12
78·0	Porton ..	89 55	83 50	86 33	*86 35	5·5	9 50	9 45	10 30	11 10
83·5	Salisbury ..	95 25	90 10	92 37	92 25	0·0	0 00	0 00	0 00	0 00
83·5	Net times (min.)	95½	89	92½	92½	83·5	88¼	89	90	92

* Estimated times. † Brookwood.

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considerable number, with a selection of which I have been able to augment my own somewhat exiguous stock. The only difficulty, on a route such as the South Western Salisbury–Exeter main line in particular, is that every correspondent appears to have his own ideas as to what strategic points should be timed and what should not. One correspondent, for example, goes to the length of taking times to the nearest second at every signal-box, and omits so vital a passing-time as mile-post 153½—Honiton summit—and every other mile-post summit as well, for that matter. Another correspondent times with great care over some sections, and one then comes suddenly across such gaps in his records as Farnborough–Basingstoke, Worting–Andover, and Sidmouth Junction–Exeter, without any intermediate times at all. In such cases I have found it necessary, where it has been possible to estimate with any likelihood of accuracy, to show estimated times at the points concerned, in order that the tables may not be so woefully incomplete as would otherwise be the case. Such additions are clearly indicated in the tabular matter, which represents four journeys in each direction between Waterloo and Exeter.

The first run from Waterloo to Salisbury and the first from Salisbury to Waterloo were both my own timing, and the former was as bad as the latter was good. The down run was made on the relieving 10.45 a.m. to Exeter, with 91 min. allowed to Salisbury, on which we steadily lost all the way to our arrival 4½ min. behind time, and that despite speeds of 75 m.p.h. at Andover and 79 below Porton, with a minimum at Grateley as high as 52 m.p.h. Beyond a beggarly 61 an hour at Hampton Court Junction and 60 at Byfleet, we never so much as reached the "60" line till we were through Overton, and such speeds as 45 m.p.h. at Brookwood, 43½ at "31," and 42½ at Worting were wretched with this load and an engine of such size and power. After topping the highest point of the route, at Oakley, we ran for miles of the ensuing 1 in 550 down-grade at round about 47 m.p.h., this alone being productive of 2 min. loss from Worting to Andover, which showed pretty clearly that the driving, and not the engine, was at fault. One would dearly like to know by what pleasant fictions a driver accounts for so palpable a loss of time as this in his journal.

The next run, after a leisurely start and

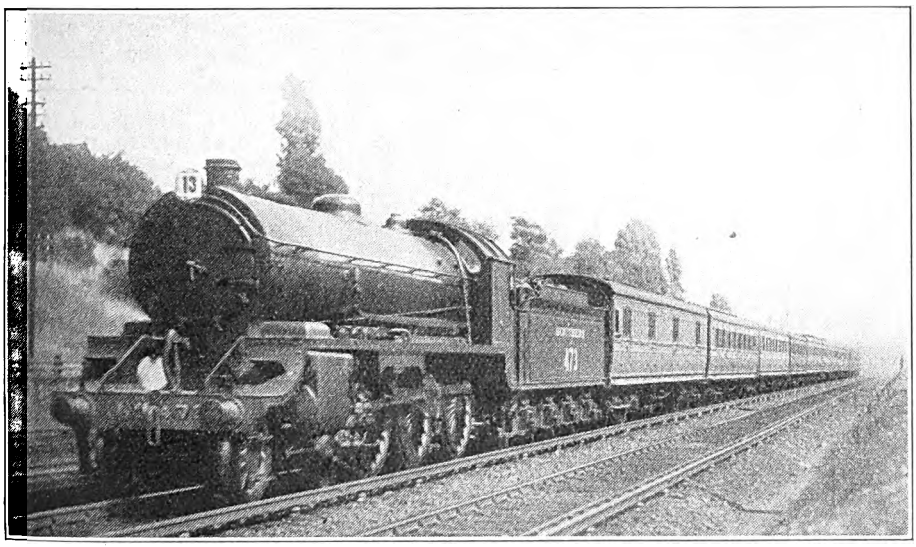

Photo.] **DOWN ILFRACOMBE EXPRESS, SOUTHERN RAILWAY.** [*F. E. Mackay.*

New 4-6-0 locomotive No. 473.

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a p.w.r. check before Surbiton, was a substantial demonstration of what these engines can really do when put to it. Speed rose to 64 m.p.h. at Hampton Court Junction and 63 at Byfleet, after which it remained above or at 60 to the 27½ mile-post, not falling below 56 at the 31 mile-post—a most unusual feat. Then came speeds of 63 an hour at Fleet and 65 at the slight dip beyond Hook, with a minimum of 47 at Worting; final maxima were 74 at Andover and 74½ at Porton, and the minimum at Grateley was 48 m.p.h. With the finish of the previous run from Andover, Salisbury might have been made in 87 min. In any case, to cover the 47·2 miles from Weybridge to Andover in 46 min. 25 sec. is a rare achievement. The detail submitted by the friend who sent No. 741's run is somewhat scanty; speeds were apparently 60 m.p.h. at Byfleet and 45 at post 31, while the maximum at Hook was 64 and the minimum at Worting 47½ m.p.h. No reference is made to the concluding speeds, but it was a run of no particular note.

Proportionately to the size of the engine, the best work was done by the rebuilt and superheated penultimate Drummond 4–4–0 No. 432; although the "60" line was not touched on the London side of Farnborough (speeds were 59 at Hampton Court Junction and 59½ at Byfleet), the minimum at post 31 was as high as 51 an hour, and the running thereafter was excellent. At Fleet the maximum was 63 m.p.h., at Hurstbourne 69; at Andover 74; and at Porton 77½; with minima of 45 at Worting and 48 at Grateley. There is a close correspondence throughout between this run and that of No. 741 in the adjacent column, with almost identical loads.

The four up runs tabulated embody some

SOUTHERN RAILWAY (S.W. SECTION). SALISBURY–EXETER.

Distance.	Engine No.	718	425	749	755	Distance.	741	745	740	749
	,, Type	4-4-0	4-4-0	4-6-0	4-6-0		4-6-0	4-6-0	4-6-0	4-6-0
	Load (axles)	28	40	32	44		32	40	40	48
	,, (tons tare)	205	266	225	295		230	267	270	330
	,, (tons full)	215	280	240	310		245	280	285	350
Miles.		m. s.	m. s.	m. s.	m. s.	Miles.	m. s.	m. s.	m. s.	m. s.
0·0	Salisbury ..	0 00	0 00	0 00	0 00	88 0	82 57	107 10	103 45	99 25
2·4	Wilton.. ..	5 35	6 00	4 54	6 18	85 6	79 21	103 25	100 20	95 40
8·1	Dinton.. ..	12 28	13 00	11 51	12 28	79·9	73 29	98 05	94 20	—
12·3	Tisbury ..	17 03	17 45	16·41	*17 00	75·7	69·37	94·05	90·05	—
17·6	Semley ..	22 36	23·35	22·35	22 28	70·4	64·37	88 35	84 45	81·20
21·7	Gillingham ..	*26 31	27 30	26 20	*26 00	66·3	59 44	83 25	79 10	*76 15
28·2	Templecombe..	32 43	33 50	32 32	32 08	59·8	53 07	77 10	72 20	69 30
30·0	Mile-post 113½	*34 43	35 55	*34 32	*34 08	†57·4	†50 28	†74 10	†69 15	*66 50
34·2	Sherborne ..	39 30	40 30	38 48	38 38	53·8	46 00	68 35	64 10	63 02
					sigs.					
38·7	Yeovil Jc. ..	43 25	44 20	42 47	43 10	49·3	41 54	64 10	59 15	58 50
42·7	Mile-post 126..	47 56	48 20	*46 42	48 50	‡47·1	‡39 56	sig. st.	‡57 10	‡56 50
47·6	Crewkerne ..	53 28	53 45	51 57	54 30	40·4	33 32	47 25	49 45	50 25
49·5	Mile-post 133 ..	*55 53	56 20	*54 22	*56 50	38·5	*31 47	45 40	*48 00	*48 40
55 7	Chard Jc. ..	62 49	63 15	61 34	63 33	32·3	23 56	38 00	40 30	41 20
60·8	Axminster ..	66 59	67 35	66 06	67 53	27·2	18 26	33 00	34 50	35 45
64 0	Seaton Jc. ..	69 58	70 30	69 15	70 47	24·0	15 36	30 30	31 50	32 53
69·5	Mile-post 153½	79 43	84 30	*79 20	80 33	18·5	*9 46	24 50	*24 40	26 50
70 9	Honiton ..	82 28	86 05	80 57	82 10	17·1	7 36	22 45	22 40	24 45
75·8	Sidmouth Jc.	85 50	90 00	84 54	86 08	12·2	17 38	16 50	17 30	18 45
79·2	Whimple ..	—	93 10	88 25	—	8 8	11 01	11 15	10 50	—
82·8	Broad Clyst ..	—	95 50	91 28	—	5·2	7 51	7 55	7 35	—
86·5	Exmouth Jc. ..	—	99 10	95 21	95 40	1·5	3 25	3 40	3 30	4 05
88·0	Exeter.. ..	98 03	101 35	97 28	98 21	0·0	0 00	0 00	0 00	0 00
88·0	Net times (min.)	98	101½	97½	96¼	88·0	98	98	103¾	99½

* Estimated times. † Milborne Port. ‡ Sutton Bingham.

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of the smartest running I have encountered on the South Western since pre-war days. The first and fastest of them, behind a Urie 4-6-0, was of my own timing; the other three, in all cases behind small Drummond superheater-rebuilt 4-4-0 engines—extraordinarily capable machines for their size—were timed by correspondents. On my run No. 745, which had come through from Exeter (changing crews at Salisbury), maintained 40 m.p.h. up the steepest section of Porton bank at 1 in 169–140, and then touched 79 an hour in descending to Andover. The 3¼ miles up at 1 in 178 that follow were mounted at a minimum of 51 m.p.h., and, touching 58½ at Hurstbourne, we breasted the 194 to Whitchurch at a minimum of 52½, maintained that rate to Overton, and then gradually accelerated up the 1 in 550 to 58½ an hour at Oakley; incidentally, this excellent work was only just sufficient for the maintenance of schedule (17½ min.) from Andover to Worting.

Some very fast running followed, with speeds of 76½ m.p.h. below Basingstoke, 66 at Hook, 70½ at Fleet, 64 at "31," a gradual acceleration to 76½ at Byfleet, 66 beyond Weybridge, and 68 at Walton, after which easing of the engine began. But the 36 miles from Worting to Esher had been covered in 31 min. 25 sec., at an average of 68·8 m.p.h., and the 68·6 miles from Grateley through to Clapham Junction, where we were only some 2¼ min. short of "even time," had occupied but 5 sec. over 65 min. With a modest signal delay of a minute into Waterloo, we therefore completed the run in 3 min. under booked time—an excellent example of potential Urie 4-6-0 running.

No. 729 also made a very sporting effort, actually faster in parts than that of No. 745, though with a considerably lighter load. The start was slightly quicker, but the best running was from Hurstbourne up to Worting, where No. 729 bettered No. 745 by 35 sec. From Salisbury the engine accelerated to 47½ m.p.h., partly up 1 in 169, and then fell to 44 on the 1 in 140; maximum at Andover was 73 m.p.h. Hurstbourne was passed at 56 m.p.h., Whitchurch at 54, and from there up to Oakley the rate fluctuated between 53 and a maximum of 60 at the latter point. Then followed 72 below Basingstoke, 60 at Hook, 68 at Fleet, 62 at "31," 71½ at Byfleet, and an easing to 59 at Surbiton, after which came signal checks. Most of these speeds were averages over not less than a full mile, so that the actual maxima

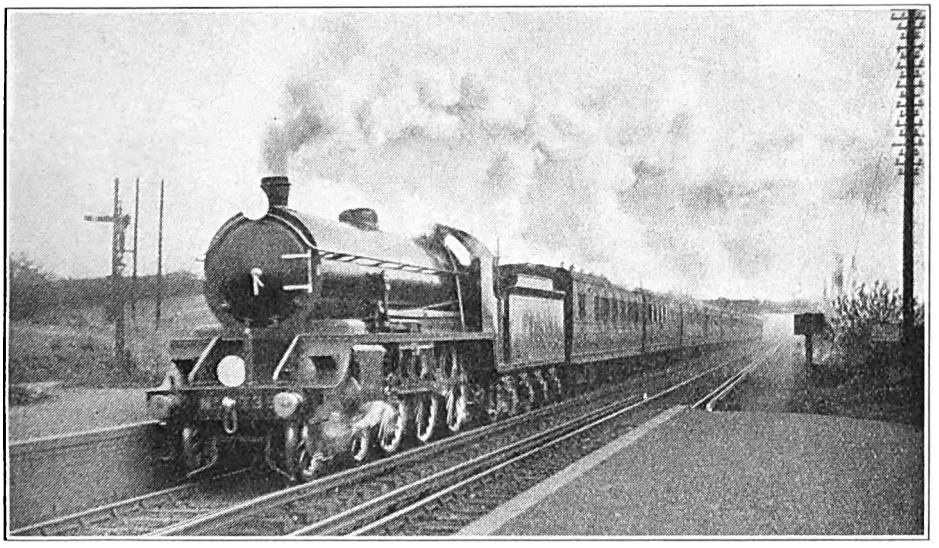

Photo.] [*H. Gordon Tidey.*

DOWN EXETER AND SOUTH DEVON EXPRESS, SOUTHERN RAILWAY.

L. & S.W. 4-6-0 locomotive No. 739.

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and minima may have been slightly higher or lower respectively. Here again the net running time was easily some 3 min. below schedule, the gross time only exceeding the booked figure by less than a minute.

The next two runs were with considerably heavier trains; my friend's indications as to speed are, in general, somewhat approximate. Minimum up Porton bank was 36½ m.p.h., and the probable maximum down to Andover was about 75; from there up to Battledown the average was 58·7 m.p.h. Speed rose to about 72 an hour below Basingstoke, and never went below 60 thence until just before post "31," where it fell to 56; the probable maximum below Woking was not above 70 m.p.h. No. 282 made a still more plucky effort, in the last column, with a tremendous 13-coach train, and, apart from the check at Pirbright and the hopeless series in from Surbiton, could and probably would have kept time. In this case no maximum and minimum speeds are quoted in the record.

There now follow the West of England runs between Salisbury and Exeter. First there is a correspondent's run with one of the original Drummond 4-4-0's, non-superheated; then one of my own timing behind one of the last large-boilered series but one—No. 425, rebuilt and superheated; and then two correspondents' trips with Urie 4-6-0 engines. Schedules were 101 min. in all cases, so that there was a commendable tendency to improve on booked time. There was also much of the old-time leaning towards free downhill running, which, though it may not represent the most ideal form of locomotive performance, is certainly exhilarating to the recorder.

No. 718, for example, touched 75 m.p.h. at Gillingham, 82 at Sherborne, 80 at Axminster and 77 at Broad Clyst, whence the engine was eased into Exeter. As regards up-grades, the minimum on the final ascent to Semley—two miles at 1 in 145—was 42 m.p.h.; the three-mile climb past Templecombe (½ at 160, 1 at 80, and 1½ at 100) produced a minimum of 40; on Sutton Bingham bank, from Yeovil Junction (3½ miles chiefly at 1 in 150–140) the lowest was 41 an hour; and the 2¾ miles of 1 in 80, constituting Crewkerne bank, brought the engine down to 36 m.p.h. Lastly, on the dreaded Colyton bank, with its 1½ miles at 1 in 100, 4½ chiefly at 80, but including ½ at 70, and a mile through the tunnel, to conclude, at 1 in 132, the speed fell to 45 m.p.h. at mile-post 150, 32 at

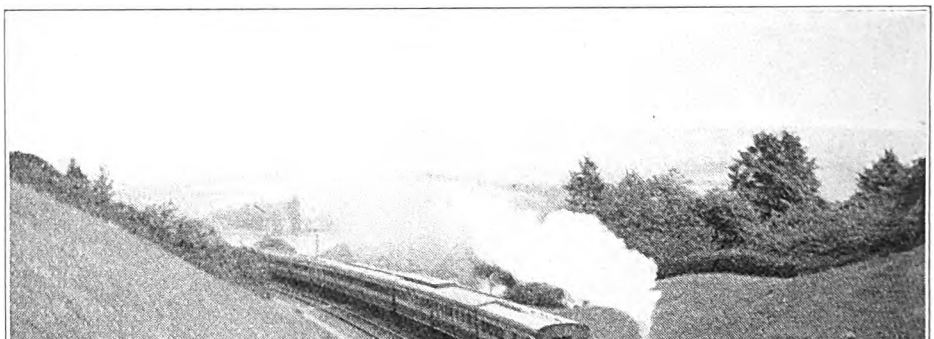

Photo.] [*E. A. Gurney Smith.*

DOWN PLYMOUTH RESTAURANT CAR EXPRESS NEAR AXMINSTER.

L. & S.W. 4-4-0 locomotive.

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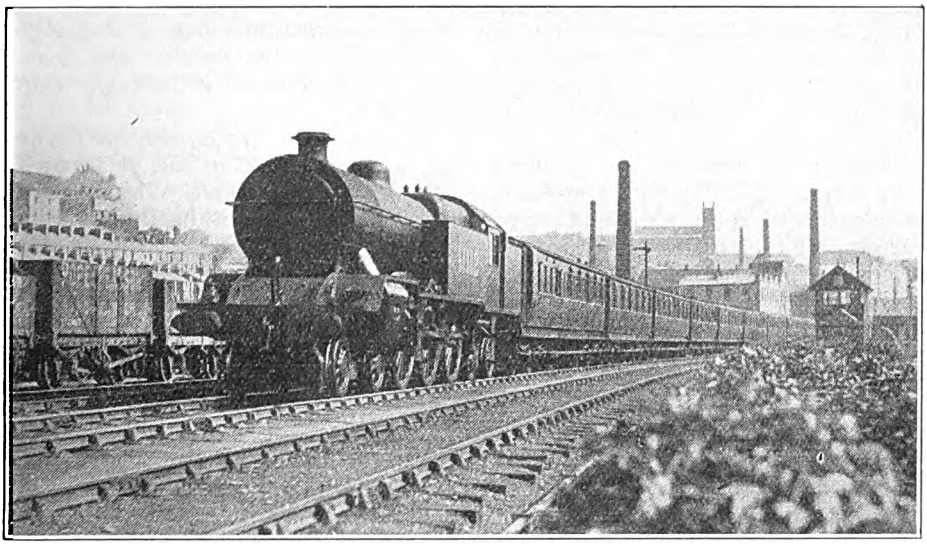
151, and 27 maintained from 152 to the summit at 153½ miles.

My run with No. 425 was made on a wet and windy day, and I could see that Driver Galpin would have a stiff task to keep time. Getting up to 58½ m.p.h. on the short descent and level before Dinton, we went up to Semley at a minimum of 46½ m.p.h. Then we were severely braked on the way down to Gillingham, and did no better than 74 m.p.h., but touched 75 at Abbey Ford, which enabled us to ascend Templecombe bank at a minimum of 41 m.p.h. At Sherborne we touched 80½ m.p.h., and, passing Yeovil Junction at 71½, mounted Sutton Bingham bank at a lowest rate of 44½. Passing Hardington at 65 m.p.h., our minimum up Crewkerne bank to Hewish was 31 m.p.h., and after going easily at first down the ensuing descent, we reached 71½ m.p.h. at Chard Junction, and gradually accelerated from there to a momentary 76½ at the lowest point beyond Axminster.

Colyton was a problem, as I had expected; we were down to 31 m.p.h. at mile-post 150, to 22½ at 151, to 16½ m.p.h. at 151, and to an absolute minimum of a shade over 15 m.p.h., as we entered the tunnel. But the driver was determined not to lose time, and once through the tunnel we fairly flew for Exeter, with a top speed of 80½ m.p.h. in the dip before Honiton, a minimum of 67 at 161¼ miles, and 85, sustained for a full mile, past Broad Clyst; in fact, we averaged 80·6 over the 5·6 miles from Whimple to Pinhoe, and breasted the last rise to Exmouth Junction at a minimum of 56½ m.p.h. This again was a very plucky run.

On the first of the two 4-6-0 down runs, No. 749 had a very easy task with only 240 tons, and gained 3½ mins.; my correspondent noted no speeds other than the ascent of Colyton bank, on which the minimum rate was 28 m.p.h. No. 755 made better times with a train heavier by 70 tons, and, in fact, gave an excellent performance. At Semley the lowest speed was 49 m.p.h., and 72 m.p.h. was not exceeded at Gillingham, though 77 was touched at Abbey Ford. On Templecombe bank the minimum was 47 m.p.h., and Sherborne was passed at 81 m.p.h. The Yeovil Junction check cost round about 2 min., and was followed by a minimum rate of 28 m.p.h. at Hewish summit. Speed ranged round 75-76 m.p.h. from Chard Junction to Axminster, after which the lowest speed on Colyton was 29 m.p.h.—a very fine feat—and the run was concluded with maxima of 75 an hour



4.25 P.M. SALFORD-COLNE EXPRESS ASCENDING HASLINGDEN BANK.

L.M.S. 4-6-4 tank locomotive No. 11112.

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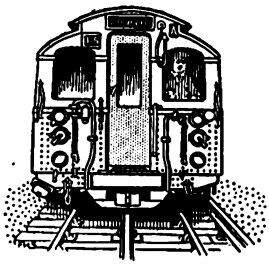
on Honiton dip, and 80½ at Broad Clyst.

In the reverse direction all the runs were with 4-6-0 engines, and the general quality was not quite so high. Mine was the second up run; the other three were timed by correspondents. No. 741 did well in the first column, the schedules being 18 min. to Sidmouth Junction and 84 thence to Salisbury, so that 1½ min. were gained. The 6-mile ascent from Broad Clyst to above Whimple, concluding with 4 miles at 145-100, brought the speed down to 34½ m.p.h. After the re-start from Sidmouth Junction, the 4½ miles at 1 in 100-90 up to mile-post 153½, at the entrance to Honiton tunnel, were covered at a speed sustained between 37½ and 34 m.p.h. for the last 2½ miles. On the descent of Colyton 78 was the highest speed touched, while the minimum at Hewish was 41 m.p.h. Sherborne bank (a mile at 165-100 and a mile at 80) gave a minimum of 40 m.p.h., and the minimum at Semley, after 4 miles up principally at 1 in 130-100, was 41 m.p.h. Faster running than usual took place from Semley to Dinton, but no maxima are given in the record, either here or elsewhere, except at Seaton.

No. 745, after a somewhat leisurely start —69 an hour at Broad Clyst, 39½ before and 61½ after Sidmouth Junction, and exactly 30 at Honiton summit—gave me the most electrifying descent of Colyton I have had for many a long day, with a maximum of 86½ m.p.h.; speed was well sustained up past Chard Junction, and the minimum at Hewish was 45 m.p.h. Descending to Crewkerne we went easily at first; but below the station we touched 76½ m.p.h., and were still going well when we were most annoyingly brought to a dead stand for signals at Hardington, having covered the 43·6 miles from Exeter in 50 min. 40 sec., start-to-stop. There we stuck for a full 4½ min., and lost, as nearly as I can estimate, a little over 9 min. Further, the check appeared to take the heart out of the driver, who had gained about 2 min. to that point, and we thereupon lost 2 min. from Yeovil Junction to Salisbury. We passed Yeovil Junction at 70½ m.p.h., fell to 30 on Sherborne bank, reached 76½ at Abbey Ford, breasted Semley at 36, and went easily down to Dinton, with a momentary maximum of 71½ an hour; the usual slack was made at Wilton. But these speeds emphasise the fact that 98 min. from Exeter to Salisbury, which—net—we just kept, is a very hard booking; very considerably harder, indeed, than 100 min. in the reverse direction, over what is undoubtedly the easier course of the two.

In the third up run, No. 740 did poorly, with speeds of 66 m.p.h. at Broad Clyst, 40½ minimum above Whimple, 31½ at Honiton tunnel, nothing higher than 69½ down Colyton, 41 at Hewish, 73 on Crewkerne bank, 65 on Yeovil bank, 30½ minimum up from Sherborne, 69½ maximum on Templecombe bank, 33½ at Semley, and nothing over 61½ down from Semley. The booking of this train was 104 min., so time was kept, but it was an uninspiring run. The last run was an excellent piece of work, with a heavy load for this road. Speeds were 61½ m.p.h. at Broad Clyst, 36 up Whimple bank, 32 at Honiton summit, 75 on Colyton bank, 46 at Hewish (very good, this), 77 on Crewkerne bank and through Yeovil Junction, 34 on Sherborne bank, 73 at Abbey Ford, 67 at Tisbury and 72 at Dinton—altogether a good effort, with no exceptionally high speeds.



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New Hook of Holland Continental Train, L.N.E.R.

COMMENCING with the 8.30 p.m. service from Liverpool Street to Parkeston Quay, Harwich, in connection with the Hook of Holland route to various Continental destinations, entirely new stock was placed in service on March 30.

As this is one of the most difficult trains worked out of Liverpool Street, and is beyond question the heaviest and longest used for Continental traffic, the working of this service, booked to cover the 68¾ miles from Liverpool Street, over a hard route, to Harwich (Parkeston Quay) in 82 minutes, constitutes one of the heaviest tasks given to engines which, although of the 4-6-0 type, are necessarily of moderate dimensions only. The new train is composed of 11 bogie coaches (each 61 ft. 6 in. long) and two Pullman coaches, and weighs altogether, without passengers, 441 tons, carriages alone, or with the engine 542 tons. There is accommodation for 186 first-class passengers and 216 second-class, and in the Pullman carriages 56. Altogether, 24 tons of passengers can be carried (counting 16 to the ton).

The first vehicle of the train is a "brake second," *i.e.*, half second-class and half brake van, followed by two carriages of second-class compartments, two second-class restaurant coaches, a combined kitchen car and first-class restaurant coach, a first-class restaurant car, three carriages of first-class compartments, and the baggage van. The Pullman coaches are in addition to these. The whole of the train is vestibuled, *i.e.*, passengers may walk from one end to the other, and combines standard improvements which are being introduced throughout the whole of the L.N.E.R. system.

One of the most interesting of these is the automatic coupling and the Pullman vestibule, which holds the coaches together in such a way that the whole train is one steel frame, with ample flexibility for curves. This special coupling is, as its name implies, automatic in its action and does away with the usual link coupling. The operation of coupling is completed by merely pushing two coaches together. The L.N.E.R. is the first British railway to introduce this type of coupling.

There is no third-class travel on this train, as is the case on other main-line services, in conformity with boat train and Continental practice. A special feature in the train is the system of lighting that has been introduced. Centre lights have been done away with, two single lights, set under the elliptical roof, together with two lights on side brackets on the corridor partition, give a mellow illumination throughout the compartments. The shades on the lamps are of flint glass. The electric light is supplied by accumulators while the train is standing at a station; and by dynamos, which generate the current, when the train is moving. The first-class restaurant cars are fitted with shaded table lamps. The locks on the carriage doors are opened only from the outside in accordance with the L.N.E.R. new standard practice for the whole of their long-distance express trains.

Notices of warning, caution, and instructions to passengers are printed in English, French, and German, so that foreign visitors may be duly warned or instructed. The first-class accommodation has been carried out in maroon leather for smoking, and blue cloth for non-smoking, compartments. Each passenger seat is provided with a separate cushion, which has been specially constructed on the Vi-spring principle with air holes at the sides, which make for increased comfort. Hassocks are also provided.

The first-class restaurant car, attached to the kitchen, is fitted out with very fine mahogany panelling. The whole of the colour scheme for the first-class restaurant car is a very pleasing light olive green from the rubber floor to the curtains at the windows. The tables are provided with shaded electric lamps. The upholstery in these cars is of buffalo hide, as also is the upholstery in the smoking compartments of the first-class coaches.

The kitchen is of compact design, with an ice box in the floor and water tanks in the roof. A tiny item which shows the

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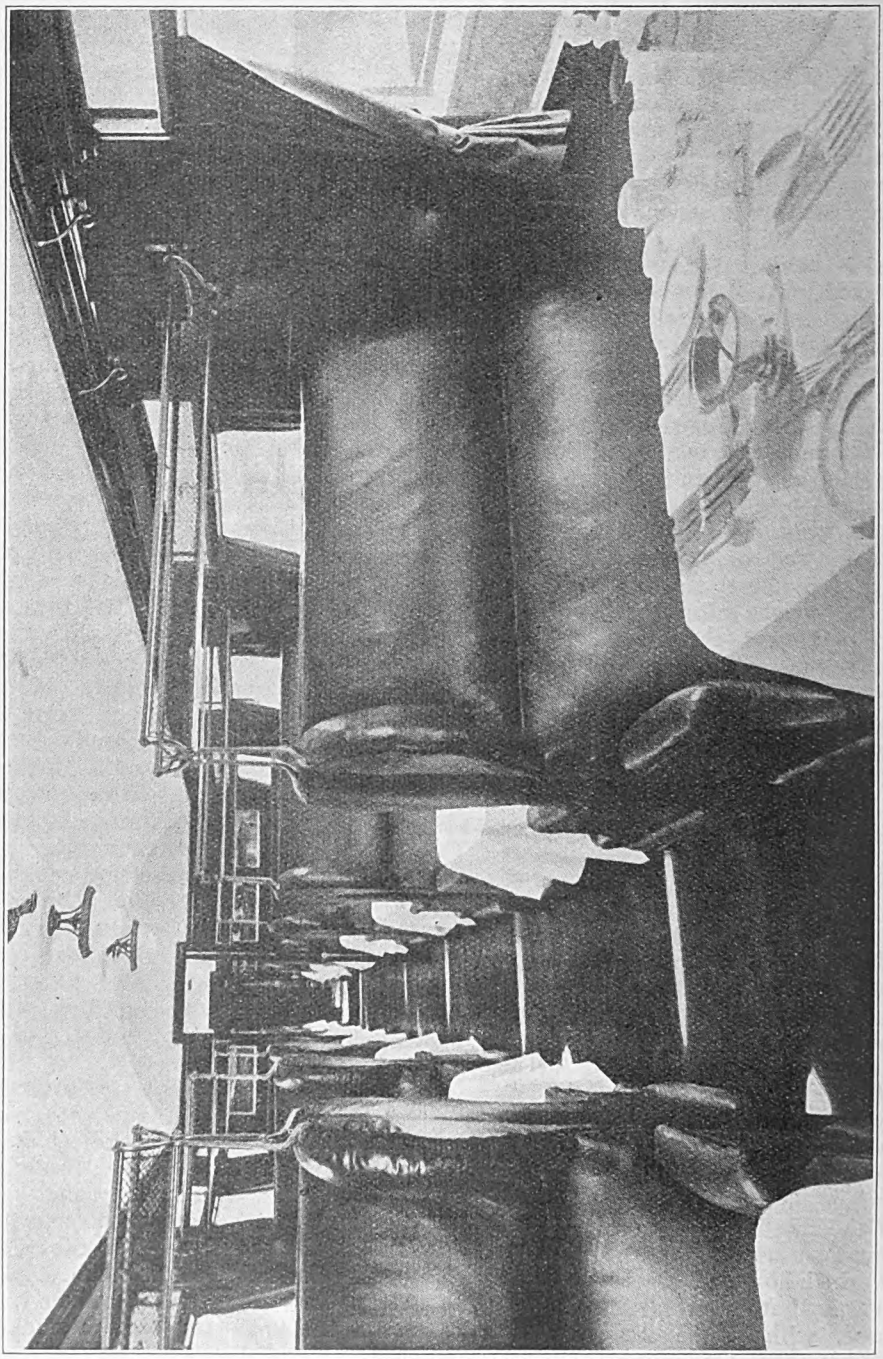

INTERIOR OF FIRST-CLASS CAR.

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thoroughness of the design of this train is a small cupboard for cigars which is kept warm by an electric light. A whole battery of switches enables the train attendants to economise or extend the lighting throughout the train. The lavatory accommodation has been thought out on the most scientific lines. The floors are covered with welded rubber with rounded corners, and an ingenious plug in the floor enables the whole lavatory to be thoroughly flushed out in a few minutes. An ingenious system of valves underneath the wash basin permits steam from the engine to heat water from the tank in the roof when hot water is required, a luxury which will be much appreciated by Continental travellers.

The following analysis of the seating accommodation may also be given :—

2nd-class brake			32
2nd-class			64
2nd-class			64
2nd-class (open)			48
2nd-class (restaurant)			48
1st-class (kitchen car)			18
1st-class (restaurant)			42
1st-class			42
1st-class			42
1st-class			42
Pullman			21
Pullman			21
Brake			—
Brake			—
Total :	1st-class	186	
	2nd-class	256	
	Pullman	42	
Grand total		484	

The new vehicles are finished in varnished teak and lettered in accordance with the practice adopted by the L.N.E.R. It is claimed that by the adoption of automatic couplings and Pullman vestibules exceptional steadiness and flexibility on curves are secured.

It may be pointed out that the Hook of Holland service to the Continent is one which ever since its inauguration has been steadily growing in public favour, and all the year round carries a full load of passengers, including, besides large numbers of tourists, a considerable proportion of business travellers. The train connects with a steamer running direct from Parkeston Quay to the Hook of Holland, where trains leave for various parts of the Continent, with through carriages for all principal destinations, at 6.24, 6.32, 6.52 and 7.22 a.m. The return services reach the Hook of Holland in the late evening, and give an arrival at Liverpool Street at 8.38 a.m. next morning. In either case the great advantage of the route is that passengers are ensured a good night's rest during the crossing, the London and North Eastern steamers employed being distinctive because of the comfortable and complete character of their sleeping and other accommodation, as well as for their seaworthiness, even at times when the North Sea is not altogether calm.

In order to demonstrate the comfortable riding qualities of the new Hook of Holland train, a special trip was made on Monday, March 30, prior to its first public run on the 8.30 p.m. "Hook of Holland" Continental express, from Liverpool Street to Southend and back, over a route involving steep gradients and many curves, a test which well indicated the easy riding attributes of the rolling-stock. The party was accompanied by a number of officers of the L.N.E.R., including Mr. R. Bell, C.B.E., Assistant General Manager; Mr. C. W. L. Glaze, District Mechanical Engineer, Stratford; Mr. J. R. Parker, Carriage and Wagon Works Manager, Stratford; Mr. W. M. Teasdale, Advertising Manager; Mr. B. Whitworth Hird, Press Consultant; Mr. A. L. Gibson, Continental Traffic Manager (South); Col. H. H. Mauldin, Chief Assistant Superintendent, Southern Area; Mr. C. J. Selway, C.B.E., Passenger Manager, Southern Area; and Mr. W. G. P. Maclure, Locomotive Running Superintendent, Southern Area.

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Coulsdon and Sutton Electrification, Southern Railway.

WEDNESDAY, April 1, saw the inauguration of electric traction on the Brighton section of the Southern Railway as far as Coulsdon and Sutton. A temporary failure on the opening morning unfortunately delayed the new services, but normal running conditions were restored later and have continued since.

As mentioned in previous issues, this extension is the fulfilment of part of a scheme prepared prior to the war to cope with the unprecedented growth of passenger traffic on the "Brighton" suburban system. Grouping and other factors have necessitated some changes in the original scheme, and the present opening is the realisation of the first portion of a comprehensive suburban electrification programme which has been embarked upon by the Southern Railway. An expenditure of £680,000 has been involved in electrically equipping 82 track miles.

In the excellent service now provided from Victoria for stations to Croydon, Coulsdon and Sutton, the Southern Railway have amply proved the truth of their slogan, "Actively Engaged in the Public Service." As their announcements show, and to take one of the examples given, namely, Thornton Heath, this station, with its dense passenger traffic, has 22 trains up to Victoria in the morning "rush-hour" period, as against 11 in the "all-steam" days, and 18 trains as against 11 in the evening "rush-hours." A standard time-table is in operation in which trains leave Victoria for Coulsdon North and Sutton at regular intervals, and at such times as are easily to be remembered by the general public.

On Tuesday, March 31, Brig.-Gen. The Hon. Everard Baring, C.V.O., C.B.E., Chairman of the Southern Railway, Sir Herbert Walker, K.C.B., General Manager, and a number of chief officers, including Mr. E. C. Cox, C.B.E., Chief Operating Superintendent; Mr. A. W. Szlumper, C.B.E., Chief Engineer; and Mr. Herbert Jones, Electrical Engineer, made a tour of inspection, accompanied by representatives of the Press. The train was one of the type used on the new service and comprised a motor-coach unit and four trailer vehicles, the motor coach being in the middle of the train. Two of these trains, making up ten vehicles in all, can be worked together for rush-hour periods.

As soon as the trial trip began, it was evident that these trains marked an important improvement in single-phase electric traction, their rapid acceleration and maintenance of high speed between stations, together with their smooth running qualities, being particularly noticeable. After reaching Coulsdon North, where there are inspection pits, staff buildings, &c., the train returned to Selhurst and reversed, proceeding thence to Carshalton Beeches, where a new station has been built in place of the rail-motor halt known previously as Beeches Halt. The platforms are good examples of pre-cast reinforced concrete work, whilst new signalling arrangements and cabin have been put in. At Sutton the track lay-out has been considerably improved for electric train terminal working and through steam traffic working; a new signal-box has been erected and platforms lengthened. The train then returned to Selhurst and the Norwood electric car sheds.

Although, we understand, it is not proposed to use the motor-coach units at present for hauling "steam" stock, yet they may be employed for shunting work on the electrically equipped lines, provision for this being made in two extra control "notches" for slow-speed movements. The new motor-coach units comprise a double motor-bogie vehicle, with two sets of overhead bow collectors. The high-tension transformer, contactor control gear, Westinghouse brake compressor and other auxiliaries, with the exception of the resistances, are situated above the floor at each end of a central guard compartment. A driving cab is at each end of the motor-coach unit. This may be compared with the older trains of the "Crystal Palace"

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and "South London" multiple-unit types which have most of the gear situated underneath the coach floor.

As at present planned, this completes the extension of the single-phase alternating-current overhead electrification system, the other extensions now in active progress on the South Western and S.E. & C. Sections being on the direct-current third-rail system.

ANOTHER STRIKING "UNDERGROUND" POSTER.

As travellers on the "Underground" are fully aware, their old friend Mr. Pennyfare made his welcome return to that system early in January last. To signalise the fact, an "Underground" artist has designed a picture poster which we reproduce herewith, and which, as will be seen, very cleverly hits off the situation.

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1825–1925.

IV.—A HUNDRED YEARS OF LOCOMOTIVE DEVELOPMENT.

By C. S. LAKE, A.M.I.Mech.E., M.I.Loco.E.

HISTORIANS record the fact that locomotives of a kind existed as long ago as the year 1770, the term "locomotive" being applied more or less loosely to what in reality was a steam wagon, which in more modern parlance we may assume would come under the far-reaching title of a "motor." Nevertheless, Cugnot's steam wagon of 1770, or thereabouts, and Murdoch's and Symington's steam wagons, produced respectively in 1784 and 1786, were locomotives, inasmuch as they were self-propelled, although used on the common roads in the absence at that time of tracks laid with rails. There were other early examples, to which in a sense the modern locomotive owes parentage, but it was not until the commencement of the nineteenth century that locomotives, as we understand them, were built to run on rails.

Trevithick's engine of 1804, in the design of which toothed or geared wheels played an all-important part in the transmission of power, is usually characterised as "the first locomotive." It had flanged wheels, and the designer employed high-pressure steam. The ordinary adhesion provided by the engine's weight was relied upon for traction, and the engine was equipped with a return-flue boiler and with a blast pipe. Ten years later, namely, in 1813, the celebrated *Puffing Billy* was completed, and in the next year, namely, 1814, George Stephenson produced his first locomotive. Designers at this time were still relying upon gear wheels or chains as transmitting members, although Stephenson had already in his second engine, namely, that of 1815, attached the connecting rods directly to crank-pins in the wheels. Although George Stephenson's *Locomotion*, which opened the Stockton and Darlington Railway in 1825, was of the type then usual, there were other engines constructed about the same time which assumed characteristics suggesting those of present-day construction. Thus, Timothy Hackworth's *Experiment* of 1825 was a six-coupled (0-6-0) type, with inclined cylinders driving the front pair of wheels, the engine, so far as wheel arrangement and some other points were concerned, approximating more nearly to later developments than did the *Rocket* of 1829. The last-named engine, however, had points of superiority over its predecessors, and there is no need to remind readers of the RAILWAY MAGAZINE that it was successful over the other competitors of the Rainhill trials in that year.

It is not necessary to trace step by step the development of the locomotive at this early period, the task having been admirably performed by writers who have devoted a considerable amount of time and attention to the historical phase of locomotive construction. In the early years of the nineteenth century, designers were busy evolving not only types but also details of engines in the light of the limited experience then available. There was still a good deal of experimental work to be done, and but very little in the way of a practical experience to go upon. The *Swiftsure* of the Liverpool and Manchester Railway, built in 1834, was the first engine to be constructed in which were combined outside, horizontal, cylinders and six wheels, and this engine also was the first ever built with four eccentrics. It was of the single-driver (2-2-2) type, and it constituted a marked advance upon previous engines of the same or approximately the same kind.

In 1836 the firm of Robert Stephenson brought out what has been described as a "standard" passenger engine, this also being of the 2-2-2 type. Other firms also introduced standard engines, that of Sharp Roberts & Co. (1837), for the Grand Junction Railway, being of the same general type. At this time cylinders of 12 or 12½ in. by 18 in. stroke, and a weight

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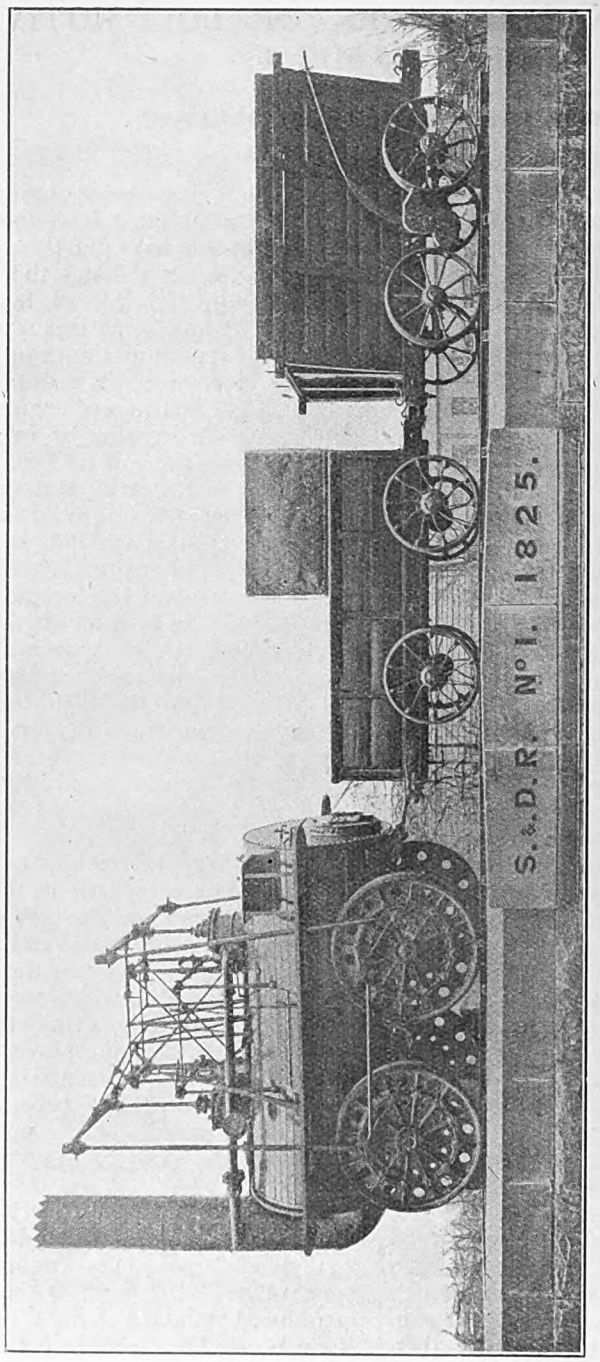

"LOCOMOTION," No. 1, STOCKTON AND DARLINGTON RAILWAY.

Built by Stephenson & Co., Newcastle, 1825.

This Famous Engine, which figured in the Railway Jubilee of 1875, will occupy the Leading Place in the Railway Centenary Celebrations of 1925.

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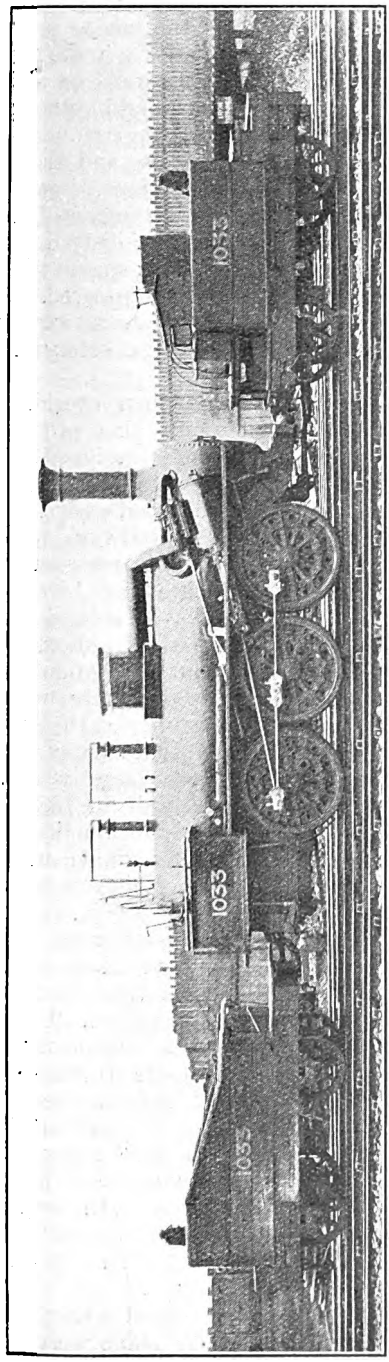
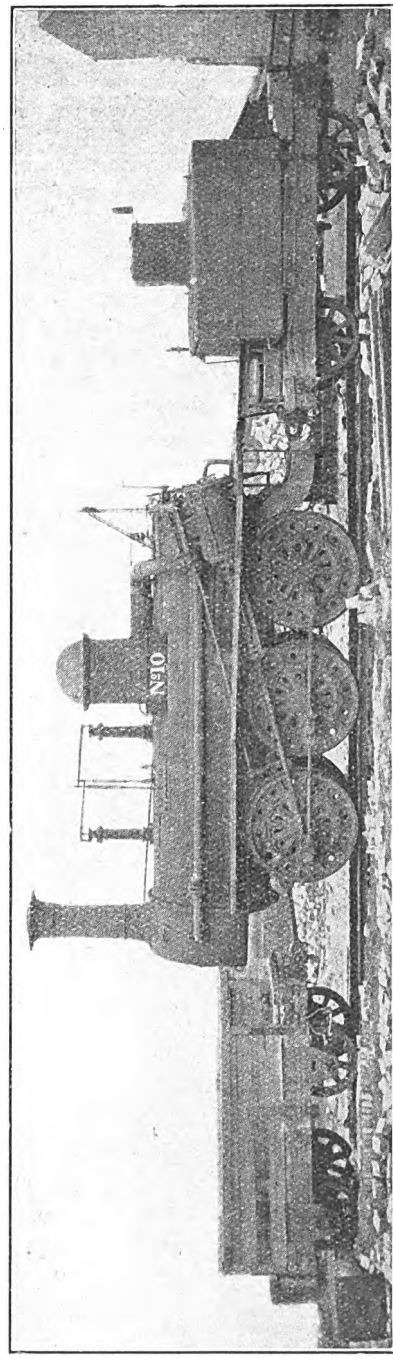


Mr. W. BOUCH'S 0-6-0 DOUBLE-TENDER LOCOMOTIVE (N.E.R. No. 1033), STOCKTON AND DARLINGTON RAILWAY.
Built by the Shildon Works Co. Ltd., Shildon, 1846.



0-6-0 DOUBLE-TENDER LOCOMOTIVE No. 10, STOCKTON AND DARLINGTON RAILWAY.
Built by Timothy Hackworth, Shildon, 1839.

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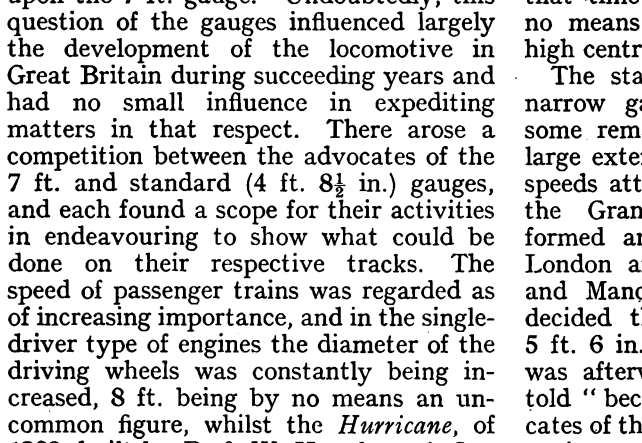
empty of about 12½ tons, constituted advanced figures, and types were developed from these beginnings which, whilst retaining the same general characteristics over a period of something like twenty years, had their proportions increased until a 17-in. cylinder and a weight of 20 tons or thereabouts became general.

With the year 1837 came what has been called the "Battle of the Gauges," when Brunel, the Engineer of the Great Western Railway, then in course of construction, invited the leading locomotive firms of the day to prepare designs for engines to work upon the 7 ft. gauge. Undoubtedly, this question of the gauges influenced largely the development of the locomotive in Great Britain during succeeding years and had no small influence in expediting matters in that respect. There arose a competition between the advocates of the 7 ft. and standard (4 ft. 8½ in.) gauges, and each found a scope for their activities in endeavouring to show what could be done on their respective tracks. The speed of passenger trains was regarded as of increasing importance, and in the single-driver type of engines the diameter of the driving wheels was constantly being increased, 8 ft. being by no means an uncommon figure, whilst the *Hurricane*, of 1838, built by R. & W. Hawthorn & Co., had driving wheels 10 ft. diameter. In this remarkable engine the driving mechanism was arranged on a separate carriage or chassis in front of the engine proper, thus making it possible to carry the boiler at a low level above the rails on a six-wheeled frame. This would otherwise have been impossible, owing to the large size of the driving wheels, and the use of a crank axle. Historians, however, have remarked that if the boiler had been placed over the driving axle instead of on an independent frame, the engine would have been considerably improved. At that time locomotive engineers were by no means convinced of the safety of a high centre of gravity.

The standard, or as then considered, narrow gauge adherents also produced some remarkable engines, designed to a large extent with a view to equalling the speeds attained on the broad gauge. On the Grand Junction Railway, which formed an important link between the London and Birmingham and Liverpool and Manchester Railways, it had been decided that driving wheels should be 5 ft. 6 in. diameter, but this dimension was afterwards increased, partly we are told "because of the taunts of the advocates of the broad gauge that narrow gauge engines could not have large wheels." An engine built in 1838 for the Grand Junction line had 6 ft. diameter single driving wheels, and cylinders 13¾ in. diameter by 18 in. stroke, and this was regarded as an excellent specimen of narrow gauge locomotive construction at that period. Up till then it was customary to employ outside framing for many and indeed the majority of engines, but, in 1838, locomotives were being built which combined inside frames and bearings with outside cylinders, and several firms thereafter adopted this form of construction.

The boilers of locomotives at this early stage were as a rule of quite small proportions, a total heating surface of about 540 sq. ft. being a usual figure on the



"INVICTA," CANTERBURY AND WHITSTABLE RAILWAY.
Built by Stephenson & Co., Newcastle, 1830.

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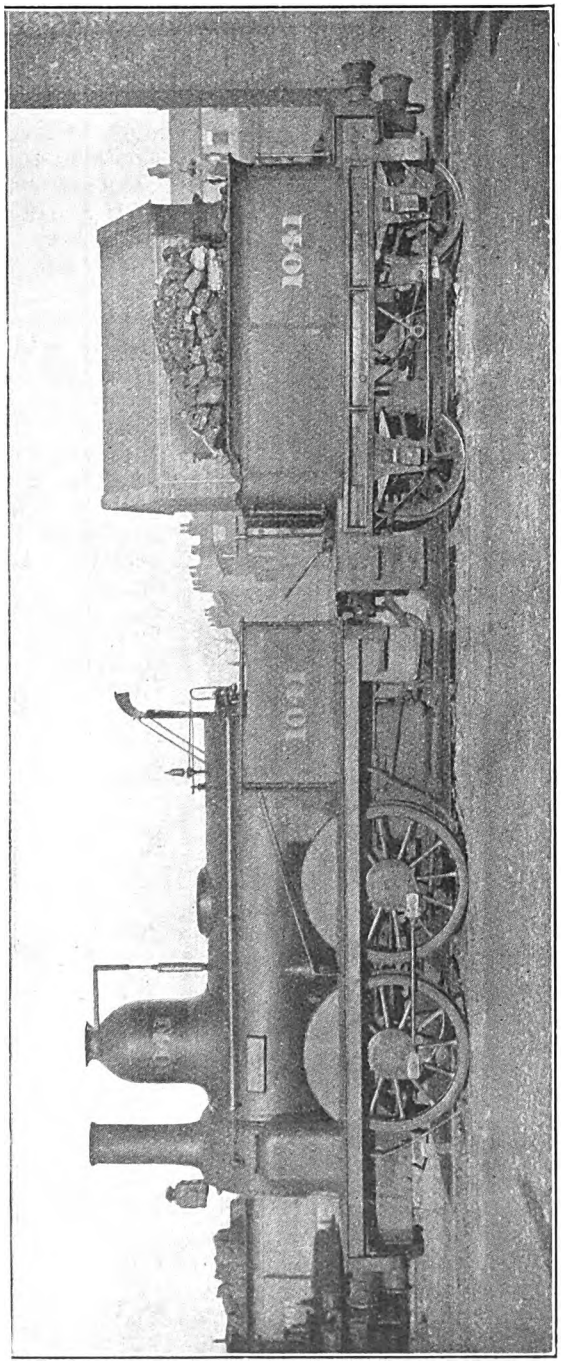
standard gauge, but by the year 1845 a broad gauge engine, the *Ixion*, was fitted with a boiler and firebox having a total heating surface of 829 sq. ft. This engine attained a maximum speed of 62 m.p.h. with an average load of 76½ tons, burning coke at the rate of 35·3 lb. per mile. Up till this time most of the passenger engines were of the single driver type, and goods engines of the 0-4-0 or 0-6-0 types. Considerable interest was aroused at about this period by the introduction of locomotives built in accordance with Mr. T. R. Crampton's patent, the distinguishing feature in this design being the large pair of single driving wheels placed between the firebox. An engine of this character, built in this country for a railway in Belgium, was tried experimentally on the London and Birmingham Railway, and attained a higher speed than any broad gauge locomotive, a fact which gave the greatest encouragement to the advocates of the narrow gauge. In spite of this fact, Mr. Bury, who pinned his faith to four-wheeled locomotives, continued to turn out engines of this class, the dimensions being small and the engines, generally speaking, wholly incomparable with those employed on the Great Western Railway. Apart from this, however, it is recorded that the narrow gauge locomotives were successfully maintaining their position upon every line other than the London and Birmingham, and showing that the speeds attained on the 7 ft. gauge could be equally well performed on the narrower one.

With a view to demonstrating, if possible, the supremacy claimed for the wide gauge, there was constructed at Swindon in 1846 the *Great Western* locomotive, a six-wheeled single (afterwards rebuilt as an eight wheeler), and in which inside cylinders were employed, the boiler having a total heating surface of 1,767 sq. ft.



0-4-0 LOCOMOTIVE (N.E.R. No. 1041), STOCKTON AND DARLINGTON RAILWAY.
Built by Timothy Hackworth, Shildon, 1840.

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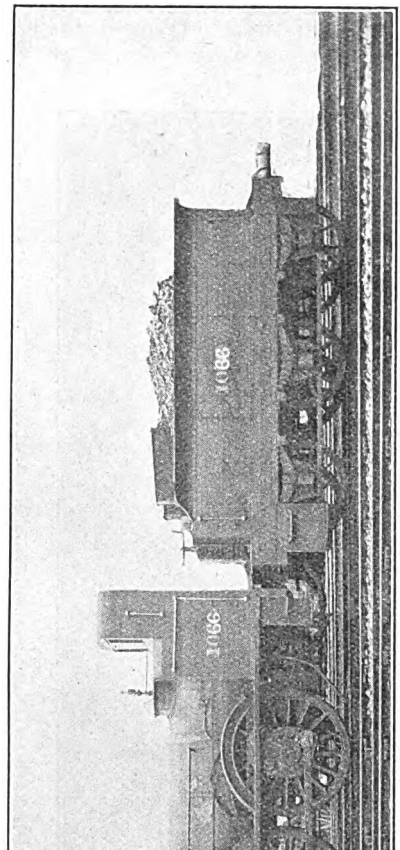
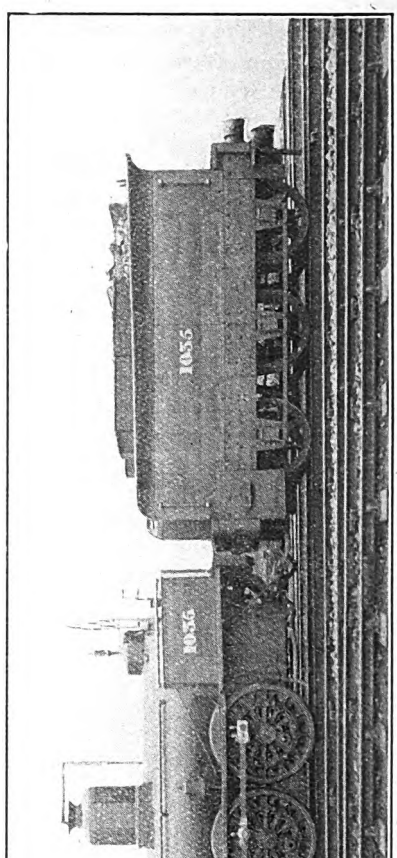


2-4-0 LOCOMOTIVE (N.E.R. No. 1066), STOCKTON AND DARLINGTON RAILWAY.
Built by Gilkes, Wilson & Co., Middlesbrough, 1847.



Mr. W. BOUCH'S 0-6-0 LOCOMOTIVE (N.E.R. No. 1035), STOCKTON AND DARLINGTON RAILWAY.
Built by the Shildon Works Co. Ltd., Shildon, 1847.

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Mr. (afterwards Sir Daniel) Gooch was Locomotive Superintendent at Swindon at that time, and no doubt can exist that the *Great Western* of 1846 set the fashion for larger and more powerful locomotives for working express passenger traffic on railways.

Even at this early period it occurred to a firm of locomotive builders to construct an engine with three cylinders, this with a view to "counteracting the alternate lifting on the opposite side of the engine." A separate set of valve motion was provided for each cylinder, whereas nowadays in many cases the valve of the inside cylinder is worked by a mechanism deriving its primary movement from one of the outside gears.

In the year 1847 there was produced the famous *Cornwall*, which had 8 ft. 6 in. diam. single driving wheels, the axle passing above instead of below the boiler. The engine was later rebuilt on normal lines, the boiler being mounted above the driving-wheel axle. The *Cornwall*, as many of the readers of the RAILWAY MAGAZINE are aware, was later subjected to further modifications, its last function being that of hauling the private saloon of the Chief Mechanical Engineer at Crewe. Crampton locomotives were built for the London and North Western Railway up to about the year 1850, one of their number, *i.e.*, the *Liverpool*, of 1848, had three pairs of carrying wheels and a pair of 8-ft. drivers—the latter, as usual in this design, being placed behind the firebox. This engine attained a speed of close upon 80 m.p.h. on the level.

From this period on, locomotive design appears to have settled down on more or less fixed lines, the single driver still remaining a favourite for the fastest passenger work, whilst engines of the 2-4-0 type began to appear in passenger service as the need for greater adhesive qualities was felt. It was not until 1873 that the first 4-4-0 type of engine made its appearance,* this being Mr. James Stirling's passenger locomotive on the Glasgow and South Western Railway. Even the appearance of this engine and the obvious advantages it offered did not deter many engineers from continuing to built single-wheeled engines for heavy express passenger service, one of the most successful being that of Mr. Patrick Stirling's with 8-ft. driving wheels and outside cylinders 18 in. diam. by 28 in. stroke—a noteworthy engine in every way. By this time other companies were introducing the 4-4-0 type, and some of them also relatively large engines having the 2-4-0 wheel arrangement.

The principle of compounding of locomotives has been developed in this country mainly by Mr. T. W. Worsdell, of the Great Eastern and afterwards of the North Eastern Railway, and Mr. F. W. Webb, of the London and North Western. Mr. Worsdell pinned his faith to two-cylinder compounds, but Mr. F. W. Webb, on the other hand, devoted his energies to the evolution of a satisfactory three-cylinder compound locomotive, of which in various forms he built a large number at Crewe works, the first—*i.e.*, the *Experiment*—appearing in 1881–82.

By this time—namely, the early 'eighties—matters had progressed considerably in connection with locomotive design. Up till a few years previously the boilers used had been of small capacity, cylinders were also of restricted dimensions, but the size of the driving wheels was, if anything, tending to increase, whilst the adhesion weight ruled low, due to the fact that the whole of the engine was of a generally light construction. As time went on, however, and the permanent-way standards improved, it was found possible to employ heavier engines fitted with larger boilers and cylinders, and capable of dealing with greater loads at higher speeds. The total heating-surface figures had risen by the year 1887 or 1888 to the neighbourhood of 1,300 sq. ft., and engines were being built which weighed, exclusive of the tender, about 50 tons, or with the tender 75 tons, and upward—in fact, some very definite ideas had been arrived at with regard to locomotive design, and the rate of progress had become considerably expedited. Improvements had also been made in connection with steam distribution in the cylinders, by utilising more accurately planned valve-gear mechanisms. The tank engine in various forms had become a more or less standardised type.

* The firm of R. Stephenson had many years before planned an engine having this wheel arrangement, and drawings existed showing its characteristics. Apparently, however, it was never built.

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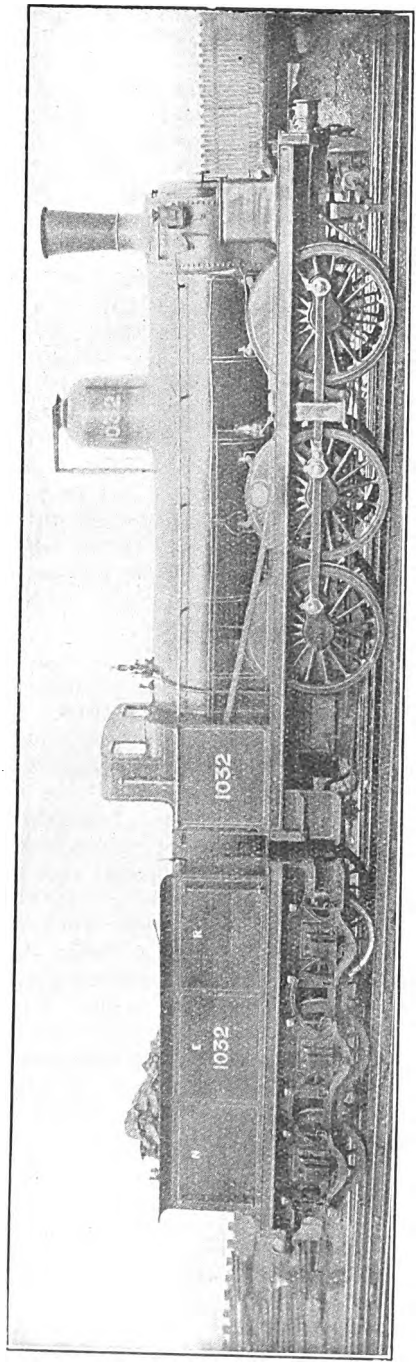
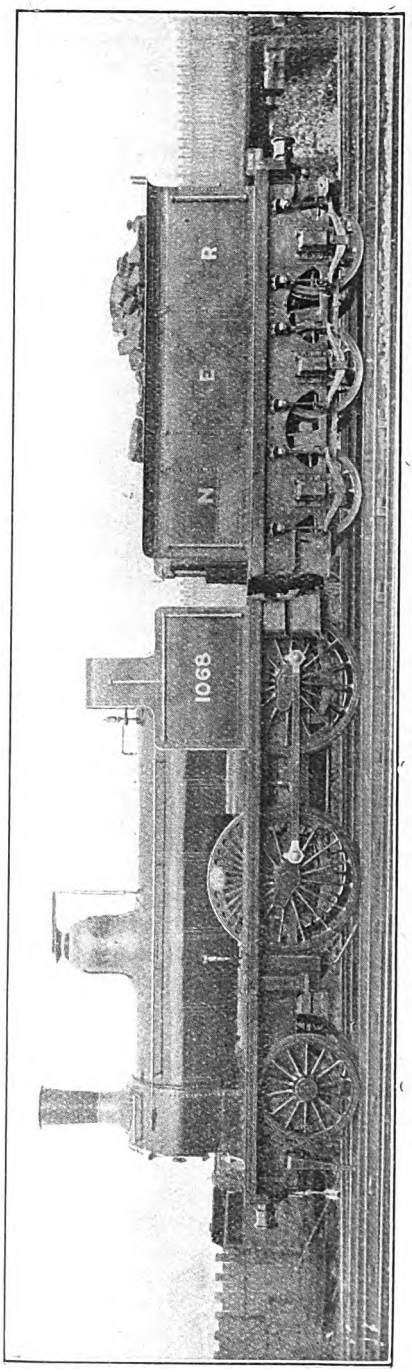


Mr. W. BOUCH'S 0-6-0 LOCOMOTIVE No. 1032, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Darlington, 1875.



Mr. W. BOUCH'S 2-4-0 LOCOMOTIVE No. 1068, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Darlington, 1875.

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The use of oil fuel had been resorted to on the Great Eastern Railway, and various other expedients connected with the building, running and maintenance of locomotives were being tried. Some remarkable engines had made their appearance on several of the railways in addition to those already referred to, among those specially worthy of mention being the "single" tank engines of the Bristol and Exeter Railway, which had 9-ft. diameter driving wheels, Sturrock's famous locomotives on the Great Northern Railway, and others of equal importance.

Among the most successful of the later engines may be classed the 2-4-0, 6-ft. 6-in. coupled type frequently referred to as "Jumbo's." These engines, of which a large number were placed in service, between them did an immense amount of valuable work on the London and North Western Railway over a long period of years, and many of them are still at work on the L. & N.W. Division of the London Midland and Scottish Railway. Locomotives of similar character were standardised on other railways, as well as, for instance, the Midland, Great Eastern, North Eastern, Great Western, and others. The type provides a cheap, light and effective form of construction, but for some considerable time past has been outclassed by the 4-4-0 type. Among the most interesting locomotives ever built for service in this country were some in which the wheel arrangement last referred to was reversed, the type becoming 0-4-2. Mr. William Stroudley built a number of such engines for service on the London, Brighton and South Coast Railway, and, in spite of these having a coupled axle leading, which might be considered a disadvantage for fast express service, the engines proved consistently successful.

With the advancing needs of traffic on railways, and the heavier locomotives made possible by improvements in the permanent way and structures, locomotive designers at a rather later period began to consider the advisability of introducing locomotives with six-coupled wheels, with, in addition, carrying wheels at the front or trailing end. Later still, the 4-6-0 type was introduced, and in its turn the 4-6-2. The "Atlantic" or 4-4-2 wheel arrangement was a natural development of the 4-4-0, and although it did not offer any pronounced advantage in the matter of weight distribution, there being still only four wheels coupled, it was possible to mount a larger boiler and leave the firebox dimensions more or less unfettered, both pairs of coupled wheels being in front of the firebox. Subsequently the 4-4-2, or "Atlantic" type, came as it were into competition with the 4-6-0, and with still further increasing traffic demands, the latter type and its successor, the 4-6-2, have superseded the other class.

As before stated, the history of the locomotive in this country has been so well and thoroughly written up, both by means of articles and separate volumes on the subject, that the present contribution to the RAILWAY MAGAZINE must not, and presumably will not, be regarded as complete, or as offering any facts not already recorded. It is intended merely as a brief survey of some of the principal features associated with the evolution of the British locomotive, and it may now be of interest to turn to a similarly brief consideration of the status which, in this railway centenary year of 1925, the steam locomotive has assumed.

Complaint is sometimes made that the state of advancement to which the steam locomotive has been brought is hardly that which might have been expected after so many years of continued study and application of the principles laid down a hundred years ago. In other words, the present-day railway engine does not represent that improvement on the early designs which such a long period of opportunity should have made possible. It is difficult to imagine exactly what those who make such assertions really mean, for, apart altogether from the question of size, weight and power, it must be conceded by everyone with a knowledge of the subject that the present-day locomotive is both scientifically and practically a totally different machine from anything that the pioneer engineers could have foreseen. This is not to say that other possibilities do not remain, perhaps, chiefly in the direction of utilising steam in a different manner from that of the ordinary reciprocating type of mechanism. There is the turbo principle, for example, and other ideas are also being worked upon, as, for instance, the combination of the internal-combustion engine and the steam

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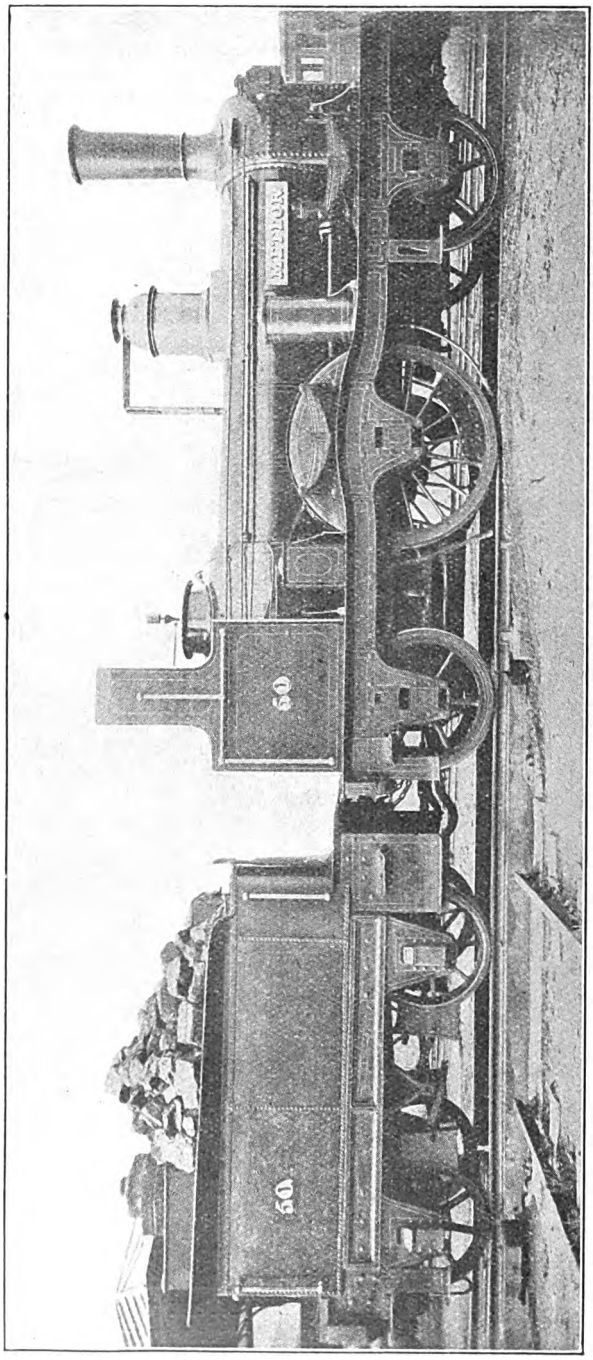

Mr. CARRETT'S 2-2-2 LOCOMOTIVE No. 50, NORTH EASTERN RAILWAY.

Built by E. B. Wilson & Co., 1850.

Actually shown as No. 273, four-wheeled tank engine, with wheels driven by coupling rods from middle driving axle which had no wheels.

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motor as the motive power for locomotives, and so on.

What we may term the "ordinary" type of locomotive is, however, to-day a highly complicated combination of appliances, especially when fitted with the many adjuncts which have successively taken their place as regularised forms of equipment. The use of superheated steam, and such fitments as piston valves, feed-water heaters, poppet valves, mechanical lubricators, &c., all tend to increase the efficiency of the locomotive. The designers' chief aim is, therefore, to provide an engine which is capable of itself maintaining an ample supply of steam for use in large cylinders; in making arrangements for the advantageous distribution of the steam to such cylinders; applying improved principles to such matters as weight distribution and methods of control; and improving the system of lubricating the cylinders, valves, and journals. Also the planning of steam passages, piping, and so forth, utilising better methods of feeding the boiler, purifying the feed water, and in other ways improving what may be termed the "internal" arrangements of the locomotive as apart from adding still further to the proportions of the engine as a whole.

Some of the earlier locomotives were phenomenally successful in such matters as low fuel consumption, economical maintenance, and so forth, this being largely accounted for, however, by the fact that the work they had to do was of a light description. Nowadays, however, the largest locomotives, and in fact many others as well, are frequently called upon to work well up to the maximum of their power, and to move their big loads at high speeds under difficult conditions. Whilst the tractive power of locomotives has enormously increased, so also have the load ratings with which they have to deal, both in passenger and freight service, and this matter is not confined by any means to the ability alone to move these loads and also to do the work without racking the engine to pieces. Those who have been privileged to ride on the footplates of engines of many different descriptions, under a variety of circumstances, will not need to be reminded that at times the strain upon the boiler and mechanism in a modern locomotive is immense, and the task of the fireman—and, for the matter of that, the driver—by no means an easy one. The success with which these difficult tasks are dealt with demonstrates, if nothing else, that it is as much the scientific advances made in the design and equipment of locomotives that make such work possible as the mere fact of their having larger proportions, and consequently a greater power output than was possible at earlier times.

If we look abroad we find that locomotive engineering—due mainly to the fact that the loading gauges are less restricted than in this country—has in some respects gone ahead of British standards. In the United States particularly, locomotives of enormous size and power, and built in accordance with highly complicated plans, are being used. It has been found necessary with these engines to provide mechanical stoking appliances, and the whole construction is such that no more apt term can be found for them than that they constitute "power houses on wheels." On the Continent also, and in various other parts of the world, larger engines than those possible here are freely used, but, when all is said and done, there is no country anywhere which can produce better engines than those designed and built in this country for use on British railways, and in this railway centenary year of 1925 it is encouraging to feel that, after all the time that has elapsed and the amount of skill, thought and ability put into the scientific development of the locomotive, that remark can be made without fear of truthful contradiction.

As representing what is possible with the "ordinary" reciprocating type of locomotive, where conditions are more or less unfettered, the engine recently introduced on the Delaware and Hudson Railway, U.S.A., may be said to mark a new standard. Strangely enough, the two-cylinder compound principle has been reverted to in this design. The boiler carries a working pressure of 350 lb. per square inch, a noteworthy departure in itself, and the engine, which is of the 2-8-0 type, weighs 273 tons. It develops a tractive force when working simple, at 35 lb. boiler pressure, of no less than 84,300 lb. It is fitted with the device known as a "booster," or assistant engine, and in simple gear with the "booster"

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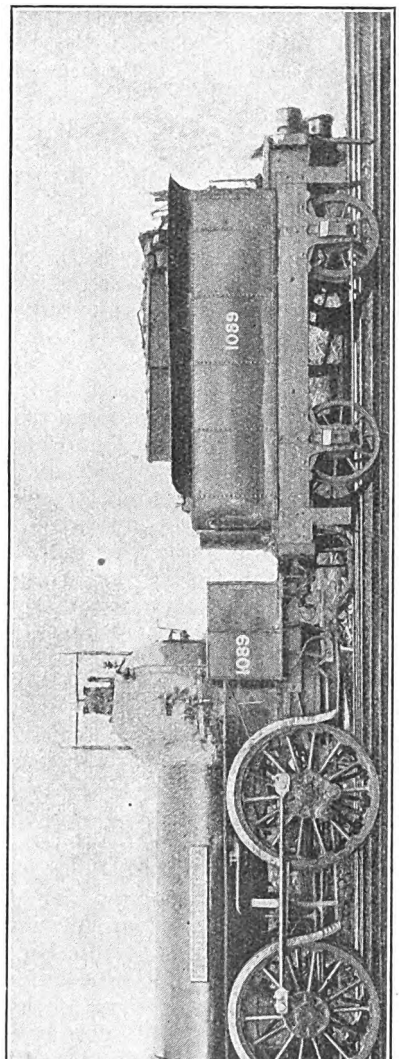
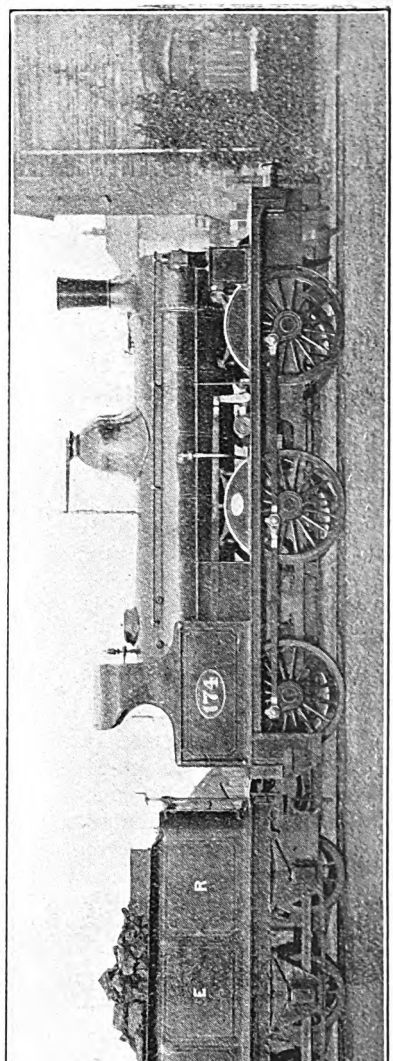


0-4-0 LOCOMOTIVE (N.E.R. No. 1089), STOCKTON AND DARLINGTON RAILWAY.
Built by W. Bury & Co., Liverpool, 1846.



Mr. E. FLETCHER'S 0-6-0 LOCOMOTIVE No. 174, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Gateshead, 1875.

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working this engine has developed a dynamometer draw-bar pull at starting of 105,000 lb. There are numerous features of design in this locomotive which support the contention made earlier that, although the main principles in the reciprocating type of engine may not be capable of much greater improvement so far as cylinders and running mechanism are concerned, there is still something to be done in the way of using steam to greater advantage.

Apart from this particular locomotive, which has only been mentioned because of its somewhat unique characteristics, very considerable strides have been made in the United States in the matter of wheel arrangements, and, in fact, it may be said with truth that almost every conceivable grouping of wheels that is reasonably usable is now being used in one form or another.

The year 1925 will be a particularly noteworthy one in this country, for the reason that it will witness the introduction of a very powerful articulated locomotive of highly advanced design. This is being built for the London and North Eastern Railway, and should, by the time these remarks are in print, be either completed or nearly so. It is planned on the "Garratt" system of articulation, with which considerable success has been achieved on certain colonial and other railways. It will be the first six-cylinder locomotive to be placed in regular service in Great Britain, and will create an altogether new standard in connection with locomotive construction here. We may also anticipate that the number of turbo locomotives in Great Britain will be added to by that now being constructed on the Ljungström principle and in accordance with British requirements. In addition, some exceptionally large and heavy goods locomotives having the 2-8-2 wheel arrangement are being built, these being of the three-cylinder pattern. These three examples alone, to say nothing of any others which may materialise, will demonstrate once again, if that be necessary, that in the matter of locomotive evolution Great Britain has nothing of which to be ashamed.

THE RAILWAY JUBILEE OF 1875.

(*Most of the engines concerned are illustrated on pages* 375–397.)

TO Mr. Henry Pease, the Deputy Chairman of the North Eastern Railway, was due the proposal to celebrate the "Silver Jubilee" of the opening of the Stockton & Darlington Railway—the first public railway to be opened for general traffic in the world—which was amalgamated with the North Eastern Railway in 1863. Mr. Pease introduced the subject at a Board meeting of the North Eastern Railway in London in the early part of 1875. The proposal was at once accepted, and the following resolution was passed unanimously :—

> This Board has been reminded that the 50th anniversary of the opening of the Stockton & Darlington Railway—the first public railway in the kingdom—will take place on September 27 next. In consideration of the importance of the event, the directors are of opinion that it should be celebrated in a suitable manner, and they accordingly appoint a committee to take the matter into consideration and carry out the provisional arrangements.

The Committee included Messrs. I. L. Bell, H. Pease, H. Kitson, and I. Wilson. Darlington was chosen as the scene of the celebration, and a local Committee to carry out the details of this plan was elected. The Chairman of this Committee was Mr. H. Pease, with whom were associated Messrs. A. Pease, H. F. Pease, and A. Kitching.

At the shareholders' meeting at York, held on August 13, the report was adopted. The North Eastern Railway Company voted £5,000 to the local Committee for celebration expenses, whilst the Darlington Corporation voted £1,000 towards the cost of decorations and illuminations at Darlington.

It may be observed that between 1801, when the first Act was passed for a railway, and 1821, when the Stockton & Darlington Railway was incorporated, 20 small lines had been sanctioned by Parliament,

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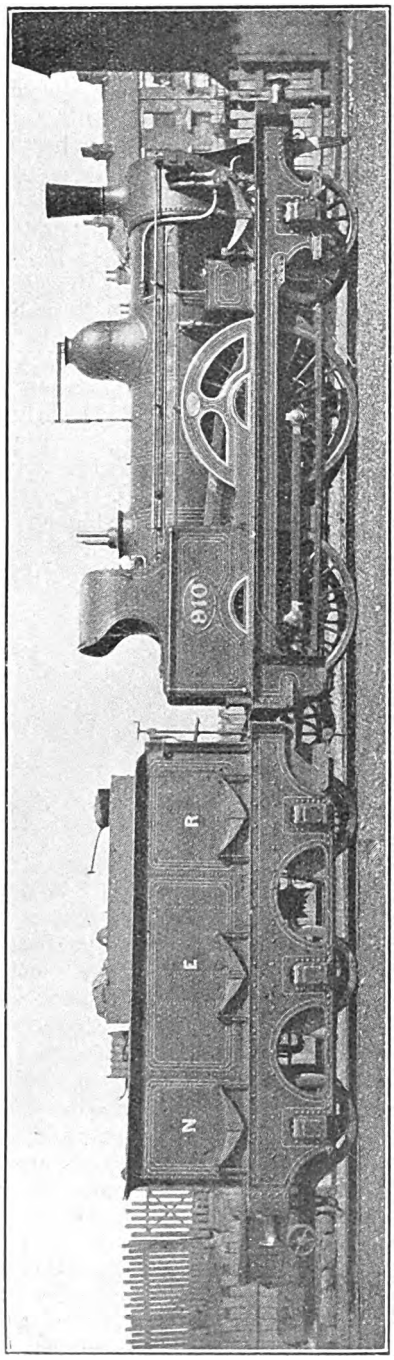
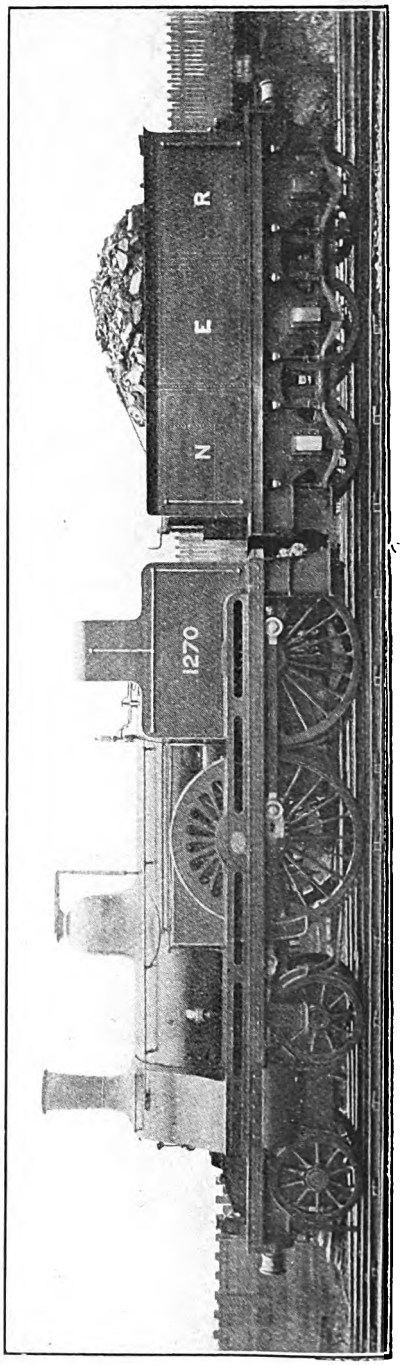


Mr. E. FLETCHER'S 2-4-0 LOCOMOTIVE No. 910, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Gateshead, 1874.



Mr. W. BOUCH'S 4-4-0 LOCOMOTIVE No. 1270, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Darlington, 1874.

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principally for the conveyance of minerals, by means of horse haulage. The Stockton & Darlington Railway was opened on September 27, 1825, so that the first day of the Jubilee commemoration was the actual fiftieth anniversary.

The proceedings were arranged to occupy two days—Monday and Tuesday, September 27 and 28. About a thousand guests were invited. Amongst those present were the Duke of Cleveland and several other peers, the President of the Board of Trade, the Lord Mayor of London and many celebrities of the period, as well as representatives of the chief railways, including chairmen, deputy chairmen, general managers, and other chief officers. Representatives of French and Dutch railways also attended. No member of the Stephenson family was present (the direct line of George Stephenson ended with the death of his famous son Robert), but five members of the Pease family participated.

At 2 o'clock on the Monday a procession, numbering about 5,000 and a mile in length, was formed in the Darlington Market square. It included the Board of directors of the North Eastern Railway Company, and the members of the Darlington Corporation, accompanied by bands, banners, &c. It was estimated that 100,000 people witnessed this procession, which proceeded to the North Road Works of the North Eastern Railway. Here was inspected one of the chief features of the celebrations—a collection of locomotives of various types and ages, "such as had never before been gathered together." The engines (see further particulars later) were arranged on two lines in the central shed of the works. Among them was the historic *Locomotion* (No. 1 of the Stockton & Darlington Railway), which, driven by George Stephenson, had opened the line fifty years earlier. This engine was once again in steam and headed the series.

Henry Pease mounted to the footplate of *Locomotion* and gave a brief account of the conception, construction, opening, &c., of the Stockton & Darlington Railway. The railway directors, members of the Corporation, &c., then proceeded to the North Road station and entrained for the Bank Top station, this journey being made to enable them to pass over a portion of the original Stockton & Darlington line. At Bank Top station the company awaited the arrival of a special train from London conveying the Lord Mayor and other guests.

A new procession, in which were included the guests from London, &c., then set out from Bank Top station to the market square. Here a statue had been erected of Joseph Pease (brother of Edward Pease, the chief promoter of the Railway), who had been treasurer of the Stockton & Darlington Railway and noted as being the first Quaker Member of Parliament. The statue had been subscribed for, designed, ordered, and erected independently of the celebration of the railway Jubilee, but in view of the importance of the Jubilee the public unveiling of the statue was arranged to form part of the Jubilee proceedings.

The Duke of Cleveland performed the ceremony—one of time's revenges in that the tremendous opposition of the father of the Duke had almost prevented the construction of the Stockton & Darlington Railway on the ground that the line as first projected would have spoilt the famous Cleveland fox coverts! A presentation of a portrait of Mr. Joseph Pease, to be hung in the Council Chamber, to the Darlington Corporation was the next event on the programme.

A banquet, to which the N.E.R. had invited nearly a thousand guests, followed. Darlington did not boast a hall sufficiently capacious to dine so large a number of people at one time. A temporary building of canvas, 200 ft. long and 80 ft. broad, was therefore erected on the cricket field. This marquee, together with the fittings, decorations, &c., came from London, whilst the whole of the dishes on the menu, the wines, cutlery, &c., were conveyed from London by special train. Mr. G. Leeman, M.P., the Chairman of the North Eastern Railway Company, presided, with Mr. H. Pease as Vice-Chairman. The menu was elaborate, and during the banquet the band of the Grenadier Guards performed. The principal musical item was a galop, "The Express Train," specially composed for the occasion by the celebrated Dan Godfrey, who conducted.

A grand display of fireworks concluded Monday's celebrations. As Darlington was not capable of housing suitably the numerous guests and thousands of others from distant parts who attended the first

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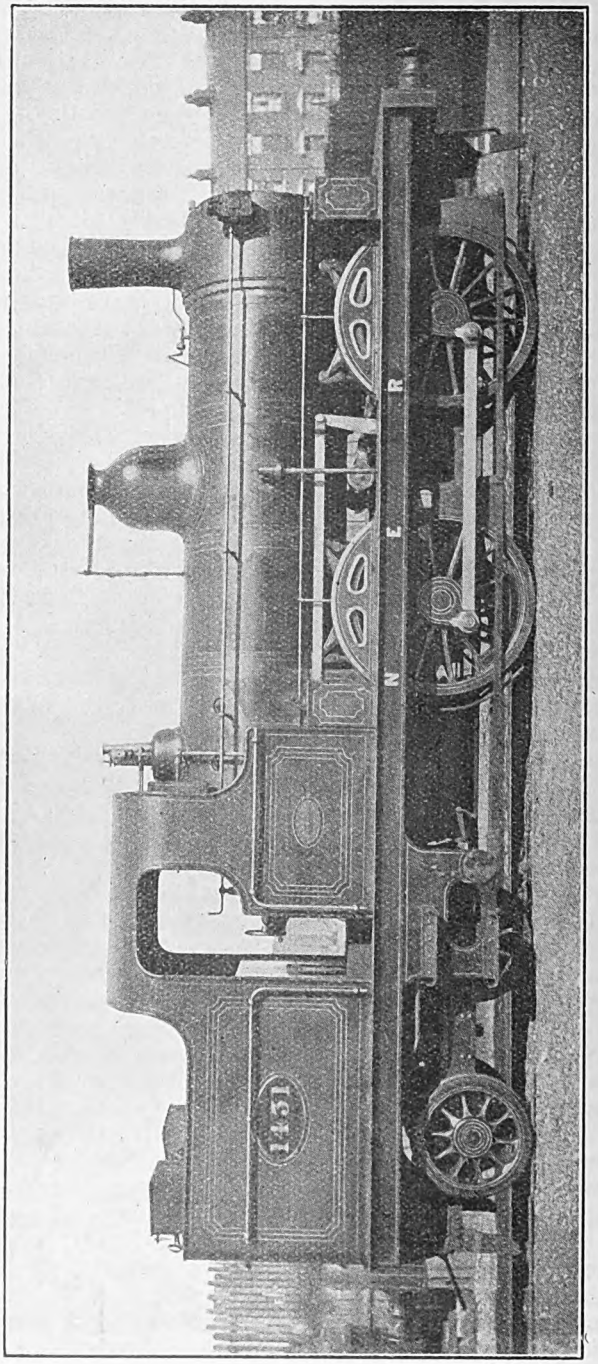

Mr. E. FLETCHER'S 0-4-4 TANK ENGINE No. 1431, NORTH EASTERN RAILWAY.

Built by R. & W. Hawthorn & Co. Ltd., 1875.

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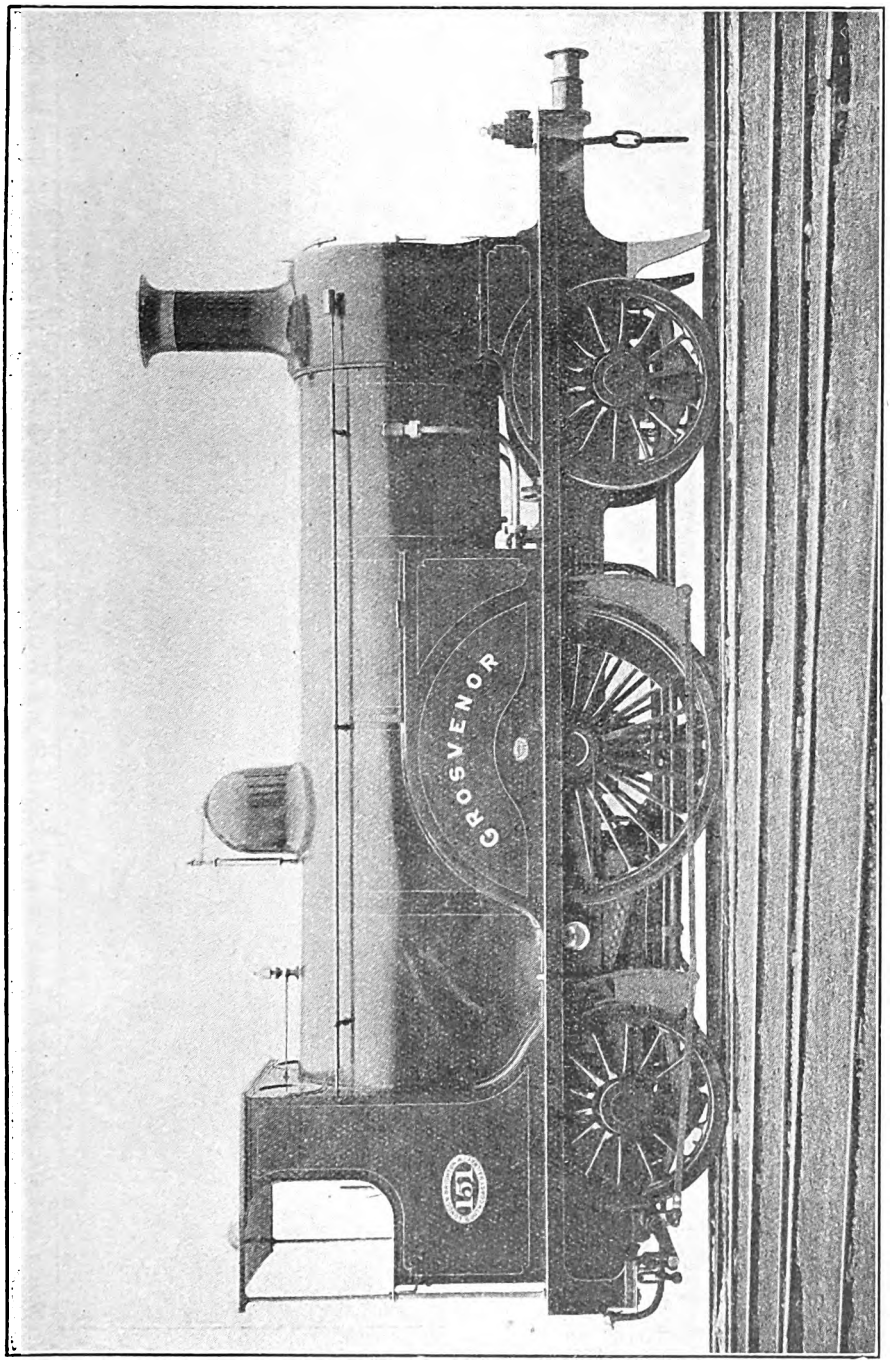

Mr. W. STROUDLEY'S 2-2-2 LOCOMOTIVE No. 151, "GROSVENOR," LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
Built by London, Brighton and South Coast Railway, Brighton, 1874.

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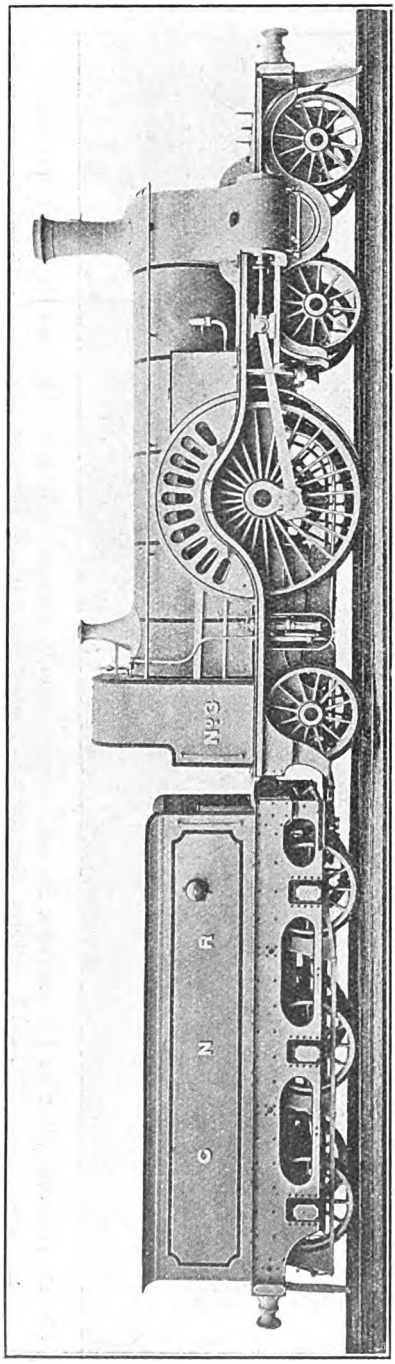
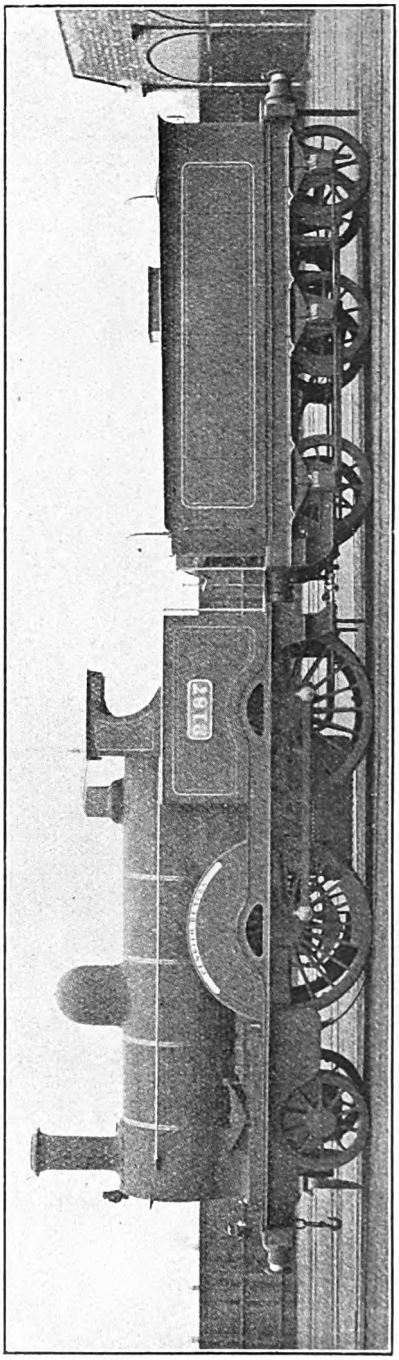


Mr. P. STIRLING'S 4-2-2 LOCOMOTIVE No. 3, GREAT NORTHERN RAILWAY.
Built by Great Northern Railway, Doncaster, 1875. (No. 47, of the same class, was actually exhibited.)



Mr. F. W. WEBB'S 2-4-0 LOCOMOTIVE No. 2187, "PENRITH BEACON," LONDON AND NORTH WESTERN RAILWAY.
Built by London and North Western Railway, Crewe, 1875.

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day's ceremonies, the North Eastern Railway ran special late trains to the surrounding towns for their convenience.

The second day was also observed as a general holiday in Darlington, where the North Road Works, Darlington Iron Works, Darlington Forge, Darlington Wagon Works and other concerns were opened for inspection by the guests. Similar facilities were afforded by various iron, engineering and other works at Stockton, Middlesbrough, Cargo Fleet, Eston, Redcar, Marske, &c. A large party travelled to Saltburn, a seaside resort created by the Stockton & Darlington Railway, where they were entertained to luncheon at the Zetland Hotel by the North Eastern Railway Company. The Grenadier Guards' band played in the grounds.

The feature of the celebration that attracted most attention was, however, the procession of locomotives in steam. The underlying idea was to show examples of the evolution of the steam locomotive on the Stockton & Darlington Railway. Unfortunately, a few years previously, some ten of the early engines, each representative of an advance in design and power, had been broken up. Therefore, it was not possible to give effect to this proposal, but specimens showing the evolution of the engine between 1839 and 1854 were exhibited, in addition to those of earlier years, as well as a passenger engine and a mineral engine specially constructed with a view to exhibition at the Jubilee celebrations, together with representatives of modern practice on various lines.

Besides the locomotives, there was also an exhibition of railway apparatus, showing the progress made during fifty years. This included models of block-signalling apparatus in use on the Stockton & Darlington Railway; Harper's space system of signalling; Stroudley's electrical communication between passengers and guard; Bouch's steam retarder, screw reversing gear and link motion as fitted to the latest S. and D. section engines; model of first railway signal-lamp at top of a pole, actuated by a chain over a pulley; and rails, chairs and stone blocks (for sleepers), as originally laid on the Stockton & Darlington Railway. There were also photographs of many of the early Stockton & Darlington locomotives. A dandy cart, which was shown in operation on both days at the North Road railway yard, attracted much attention. A dandy cart was fitted at the rear of early horse-hauled mineral trains on the Stockton & Darlington Railway. Three or four wagons with dandy cart at rear were hauled by a powerful horse until the train reached a descending gradient, when the horse was unhooked; he then waited until the train he had been hauling passed him and jumped into the last vehicle—the dandy cart. When the train reached the bottom of the incline the horse jumped out, trotted to the front of the train, was hitched on again, and hauled the vehicles.

In an issue of the period the *Railway News* reproduced extracts described as "The Record of the Opening of the Stockton & Darlington Railway, by Thomas Meynell, Esq., on his Return Home after the Day's Proceedings."

Commenting upon Mr. Meynell's references, in his speech at the banquet, Mr. Pease pointed out that with regard to the engine *Locomotion* the cost was only £500, and at that time there was but a single line of railway with places for passing. "A considerable number of horses were used, and we find in the old bills distinct regulations as to what part of the company's traffic was to give way for the coal train, and what part of it was not to give way to the train. As the trade increased other engines were ordered, and it was found with a single line of railway that the passings led to a great deal of quarrelling and detention."

Mr. Hackworth, who was then the manager of the railway, and whose name has always been mentioned in the early development of railways, appealed to the directors and implored them to double the line in terms rather amusing. He was a Newcastle man, a man of much thought and a good mechanist. He came to the board, and when he could make no better of it, and they were rather chary of going to the expense he suggested, he said, "Gentlemen, I only wish you to know that it would make you cry to see how they knock each other's brains out." There was no resisting such an appeal. The line must be doubled and it was doubled. Stronger engines were put on; but then came another difficulty. The enginemen, who were a very willing race, were not accustomed to handle these engines and they put on the power of the steam too rapidly. There were no buffers on the trains then, and the consequence was that the wagons got knocked together most cruelly, and the coal was thrown out of them to the great

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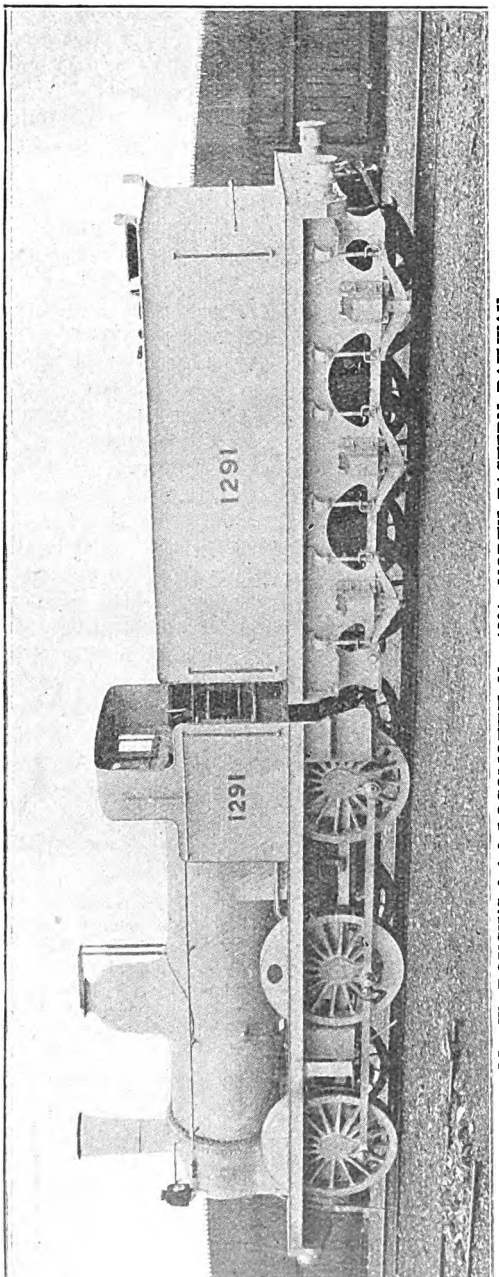
annoyance of the coal owners, who could not deliver them as put into the wagons. The result of this was that the enginemen had to be brought to book for the way they abused the wagons and wasted the coals. They came before the committee, were told of their faults, and informed that such conduct could not be endured. The men replied very honestly, "Gentlemen, if you will give us two long chains and let us put them round your railway office we will take our two engines and pull you and the railway office away together, and you shall know nothing at all about it." This argument was, of course, powerful; but the men received a caution, and bye-and-bye they learnt better how to manage the engines entrusted to their charge.



Mr. W. BOUCH'S 0-6-0 LOCOMOTIVE No. 1291, NORTH EASTERN RAILWAY.
Built by North Eastern Railway, Darlington, 1875.

After making reference to relations between the directors and officers and the staff, precautions taken to avoid accident, and generous treatment of staff who suffered therefrom at any time, Mr. Pease pointed out that "from 1825 to the day on which the Stockton & Darlington Railway was completely amalgamated with the North Eastern, I think in the year 1872, although the passenger traffic for the few years previous to that had been enormous, we transferred that old line of railway to the North Eastern Company clear of the blood of any of Her Majesty's subjects."

The Engine Exhibition was thus described: "The show was as singular as interesting. Under the immense central shed of the North Eastern Company's works there stood, in two long rows, upwards of two score engines, exhibiting the history of the locomotive from its infancy to the present day. . . . First of all, the centre of general attraction, there was the *Locomotion*, or, as sometimes called, the 'No. 1' engine, built by George Stephenson, and driven by him at the opening of the Stockton & Darlington, now destined, after the end of half a century, to be once more galvanised into life by whiffs of steam."

A souvenir of the "Jubilee Memorial of the Railway System" was prepared by Mr. J. S. Jeans, giving an authentic account of the projection, construction and development of the Stockton & Darlington Railway, with appendices. One appendix gave particulars of the Stockton & Darlington locomotives it was proposed should take part in the Jubilee proceedings. This list included the following engines, though the notes given include our own comments :—

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I.—Stockton & Darlington Engines.

Locomotion.—The first locomotive to run on a public railway, built in 1825 and run on S. and D. Railway until 1850, when it was acquired by J. Pease & Partners and used on their colliery railway until 1857. The engine was then placed on a pedestal outside Darlington railway station. Subsequently placed on permanent exhibition at Bank Top station, N.E.R. Now at the British Empire Exhibition, Wembley.

Auckland, No. 10, S. and D.R., 0-6-0. Built in 1839 by T. Hackworth and later sold to the Consett Water Company, and at work in 1875.

Shildon, No. 1033, N.E.R., 0-6-0. Built by W. Bouch at Shildon about 1845, and at the time of the Jubilee still in work on the S. and D.R.

Dart, No. 1041, N.E.R., 0-4-0. Built by T. Hackworth about 1844.

Meteor, No. 1050, N.E.R., 2-2-2 passenger engine. Built at Shildon in 1843.

Woodlands, No. 1058, N.E.R., 2-4-0 passenger engine. Built in 1848 by A. Kitching, and at work in 1875 on the S. and D.R.

Southend, No. 1062, N.E.R., 0-6-0. Built by Gilkes, Wilson & Co. in 1849, and at work on the N.E.R. in 1875.

Priam, No. 1066, N.E.R., 2-4-0. Built in 1847 by Gilkes, Wilson & Co., Middlesbrough.

Duke, No. 1080, N.E.R., 0-6-0. Built at Shildon Works in 1854, and at work in 1875 on the S. and D.R. section.

Hawthorn, No. 1082, N.E.R., 0-6-0. Built by R. and W. Hawthorn, Newcastle-on-Tyne, in 1854, and at work on the S. and D.R. in 1875.

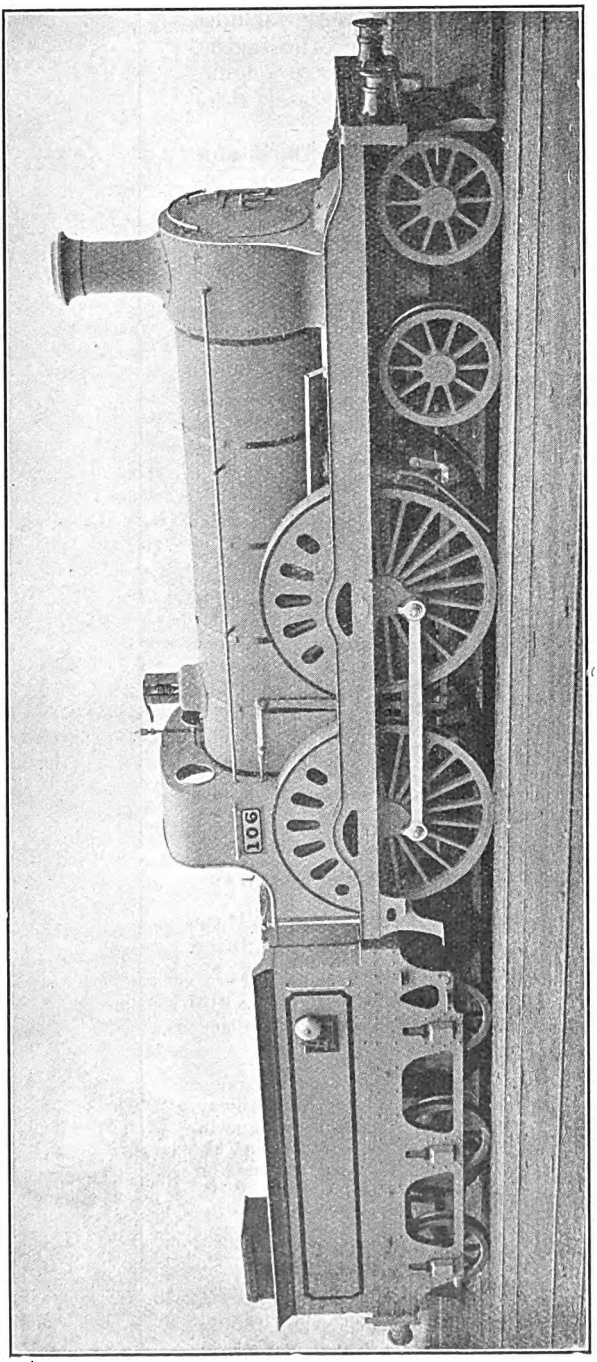
Albert, No. 1084, N.E.R., 0-6-0. Built by Gilkes, Wilson & Co. in 1854, and at work in 1875 on the S. and D.R. section.

No. 1270, N.E.R., the latest of the "Ginx's Babies" class, 4-4-0 bogie passenger engine Designed by W. Bouch and built at the North Road Works, Darlington, in 1874.

No. 1291, N.E.R., 0-6-0. Built at North Road Works in 1875. A "Jubilee Memorial" engine, said to have been built in seven days.

No. 1068, N.E.R., 2-4-0 passenger engine, coupled wheels 6 ft. diam. This was also a "Railway Jubilee" engine, built at North Road Works in August, 1875, from designs of W. Bouch.

In Mr. Jeans' appendix it was also stated that other locomotives, including



Mr. J. STIRLING'S 4-4-0 LOCOMOTIVE No. 106, GLASGOW AND SOUTH WESTERN RAILWAY.
Built by Glasgow and South Western Railway, Kilmarnock, 1875.

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No. 1160, a 4-4-0 built by Stephenson & Co. in 1860, and No. 1221, built by Hawthorn in the same year, would form part of the locomotive exhibit. Although several of the above bore N.E.R. numbers, they all belonged to the Stockton & Darlington section. Although several of the engines mentioned above were included in the Jubilee exhibition, the actual Stockton & Darlington Railway engines were not, apparently, in all cases those given in Jeans' list.

Three other Stockton & Darlington Railway engines were shown, presumably in place of some of those originally intended :—

Commerce, No. 1035, N.E.R., 0-6-0. Built at Shildon in 1847 from designs by W. Bouch.

Huddersfield, No. 1089, N.E.R., 0-4-0 mineral engine. Built by E. Bury & Co., of Liverpool, 1846, for S. and D.R. Bar frame, haystack firebox, and usual "Bury" characteristics.

No. 1032, N.E.R., 0-6-0 mineral engine. Designed by W. Bouch and built at North Road Works in 1875.

II.—North Eastern Railway Locomotives.

The N.E.R. exhibits were :—

No. 273, Crampton 0-4-0 tank locomotive with intermediate driving shaft. Built by E. B. Wilson & Co. about 1850.

No. 910, 4-4-0 express passenger. Designed by E. Fletcher, N.E.R. Locomotive Superintendent, and built at Gateshead in 1874. This engine took part in the Newark brake trials in the summer of 1875.

No. 174, 0-6-0 mineral engine. Designed by E. Fletcher and built at Gateshead in 1875.

No. 1431, 0-4-4 bogie tank engine. Designed by E. Fletcher and built by Hawthorn, Newcastle-on-Tyne.

III.—Locomotives of Other Railways.

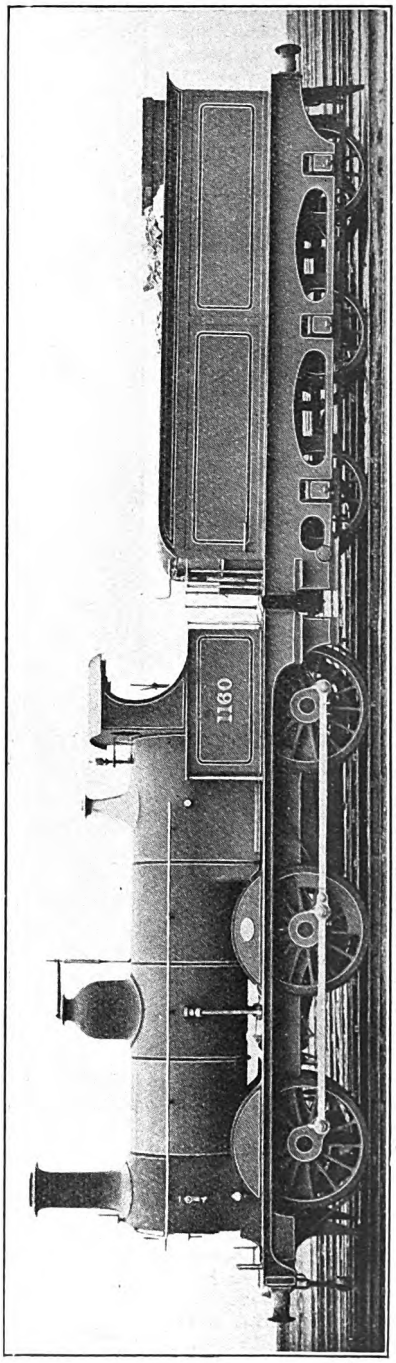
The locomotives of other railways consisted of five specimens exhibited by the L. & N.W., L.B. & S.C., G.N., G. & S.W., and Midland Railways, and representing the most recent practice. The S.E.R. also sent :—

Invicta, built in 1830 by R. Stephenson & Co. for the Canterbury and Whitstable Railway, 0-4-0. Mr. Fletcher, the Locomotive Superintendent of the N.E.R. in 1875, stated at the "Jubilee" that he helped to build this engine, took it from Newcastle to the C. and W.R., and drove it on that line for three or four months.

The other engines shown were :—

Penrith Beacon, No. 2187, L. and N.W.R., 2-4-0 express locomotive, Designed by F. W. Webb, Locomotive Superintendent, and built at Crewe Works in 1875. This engine worked the Webb & Clark chain brake train at Newark brake trials.

Grosvenor, No. 151, L.B. and S.C.R., 2-2-2 express engine. Designed by W. Stroudley, Locomotive Superintendent, and built at Brighton Works in 1875. This engine also was employed in the Newark brake trials in 1875.



Mr. S. W. JOHNSON'S 0-6-0 LOCOMOTIVE No. 1160, MIDLAND RAILWAY.
Built by Kitson & Co., Leeds, 1875.

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No. 47, G.N.R., 4-2-2 express. Designed by P. Stirling, Locomotive Superintendent, and built at Doncaster Works in 1875.

No. 106, Glasgow & South Western Railway, 4-4-0 express. Said to be the first bogie engine combining coupled wheels as large as 7 ft. diam., and inside cylinders as large as 18 in. diam. Designed by J. Stirling, Locomotive Superintendent, and built at Kilmarnock Works in 1875.

No. 1160, Midland Railway, 0-6-0 mineral engine. Designed by S. W. Johnson, Locomotive Superintendent, and built by Kitson & Co., Leeds, in 1875.

NAMING SOUTHERN RAILWAY LOCOMOTIVES.

We are indebted to officers of the Southern Railway for the following particulars of the names to be given to Southern Railway locomotives:—

REBUILT DRUMMOND 4-6-0 ENGINES.

453 *King Arthur*
454 *Queen Guinevere*
455 *Sir Lancelot*
456 *Sir Galahad*
457 *Sir Bedivere*
448 *Sir Tristram*
449 *Sir Tor*
450 *Sir Kay*
451 *Sir Lamorak*
452 *Sir Meliagrance*

EXISTING URIE 4-6-0 ENGINES.

736 *Excalibur*
737 *King Uther*
738 *King Pellinore*
739 *King Leodegrance*
740 *Merlin*
741 *Joyous Card*
742 *Camelot*
743 *Lyonnesse*
744 *Maid of Astolat*
745 *Tintagel*
746 *Pendragon*
747 *Elaine*
748 *Vivien*
749 *Iseult*
750 *Morgan le Fay*
751 *Etarre*
752 *Linette*
753 *Melisande*
754 *The Green Knight*
755 *The Red Knight*

NEW ENGINES OF URIE 4-6-0 CLASS.

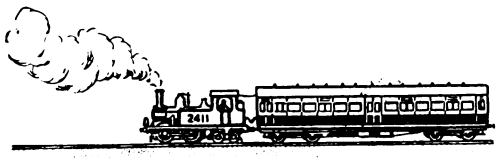
763 *Sir Bors de Ganis*
764 *Sir Gawain*
765 *Sir Gareth*
766 *Sir Geraint*
767 *Sir Mordred*
768 *Sir Balin*
769 *Sir Balan*
770 *Sir Sagaramore*
772 *Sir Percivale*
773 *Sir Lavaine*
774 *Sir Gaheris*
775 *Sir Agravaine*
776 *Sir Galagars*
777 *Sir Lamiel*
778 *Sir Pellas*
779 *Sir Colgrevance*
780 *Sir Persant*
781 *Sir Aglovale*
782 *Sir Brian*
783 *Sir Gillemore*
784 *Sir Nerovens*
785 *Sir Mador de la Porte*
786 *Sir Lionel*
787 *Sir Menaduke*
788 *Sir Beaumains*
789 *Sir Guy*
790 *Sir Villiars*
791 *Sir Urwaine*
792 *Sir Hervis de Revel*

BRIGHTON SECTION 4-4-2 ENGINES.

421 *South Foreland*
422 *North Foreland*
423 *The Needles*
424 *Beachy Head*
425 *Trevose Head*
426 *St. Alban's Head*
37 *Selsey Bill*
38 *Portland Bill*
39 *Hartland Point*
40 *St. Catherine's Point*
41 *Peveril Point*

S.E. & C. SECTION 2-6-4 TANK ENGINES.

790 *River Avon*
791 *River Adur*
792 *River Arun*
793 *River Ouse*
794 *River Rother*
795 *River Medway*
796 *River Stour*
797 *River Mole*
798 *River Wey*
799 *River Test*



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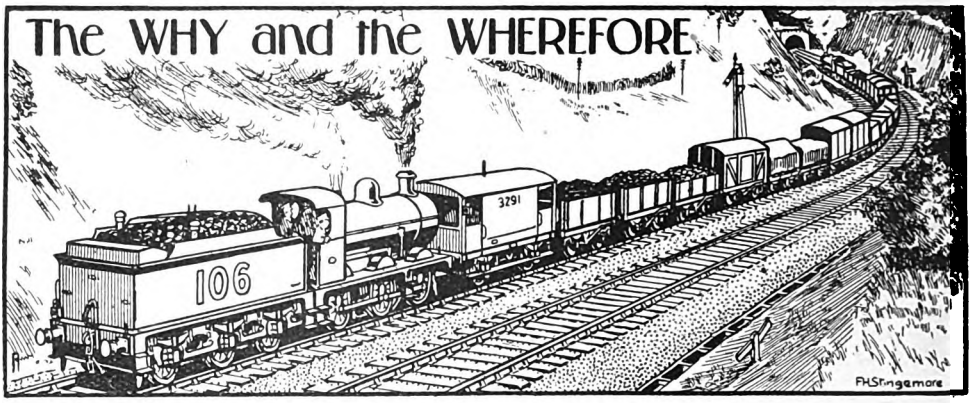

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications for information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, *33, Tothill Street, Westminster, London, S.W.1. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book" (5s. net) should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

Pullmans on Boat Trains, Etc.

You question our accuracy as to the first Pullmans in the Dover boat trains by stating that drawing-room cars or "so-called Pullmans" were running in 1892. The drawing-room cars were neither built nor owned by the Pullman Company, and therefore were not Pullman cars. You may be interested to know that earlier than 1892—in 1889—the International Sleeping Car Company provided the Club train of drawing-room cars for the London–Dover Continental service. You are mistaken as to the weight of the six-wheel stock of the S.E. and C. Section of the Southern Railway. These vehicles weigh 11, 12, 13, and 14 tons. The Chatham coaches are only 12 tons, and brake vans 11 tons; S.E. six-compartment thirds mostly 13 tons. Many of the old L. and S.W. six-wheel stock running in the duplicate close-coupled sets on the S.E. and C. section weigh 12 tons, as do the S.E. and C. iron brake vans. We doubt if the average weight of six-wheel stock on the S.E. and C. section is as high as 13 tons, and now you suggest that, because 14 coaches only weigh 186 tons, they must be four-wheel and not six-wheel. There is no ground for doubting the statement of the Inspecting Officer of the Ministry of Transport that they were six-wheel vehicles. The French Nord line has several "Pacifics" in service, the number was increased about 10 months ago; they are regularly employed on the boat and on the Paris–Brussels expresses.

[Further reply to H. D. HEWITT.]

Early Midland Railway Sleeping Cars.

The first sleeping cars introduced in 1874 on the Midland Railway, were Pullman vehicles, built in America, and put together at Derby. They were carried on two 4-wheel bogies, the bodies were 51 ft. 6 in. long, without the exterior end platforms. In addition to the berths there were lavatory, smoking and attendants compartments, &c. The weight was 20/21 tons only. The berths were arranged longitudinally; we cannot obtain exact information as to number of berths, but we believe there were five or six aside, thus providing with the upper berths 20 or 24 berths per car. Third-class sleeping cars are unlikely to be introduced, they would not be a paying proposition. A corridor coach with seats for 64 third-class passengers would only accommodate 28 sleepers with upper berths, such as you suggest. Taking the third-class fare at 30s. per journey, 64 passengers would mean £96; whilst 28 passengers at 30s., plus your proposed 5s. per berth, would

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provide only £49. The sleeping car could only be used for night journeys ; the third-class coach can be utilised at all times.

[Reply to H. L. LEWIS.]

Snow Hill Bank, S.R.

The connecting line through Snow Hill from Farringdon Street to Ludgate Hill was, at one time, used by quite a number of passenger services, including Great Northern and Midland suburban trains working round to Victoria over the South Eastern and Chatham Railway, and both London, Chatham and Dover and South Eastern trains, the former making similar journeys and the South Eastern trains running to Woolwich, Blackheath, &c. These were all gradually discontinued during years previous to the war and have now entirely disappeared, though a great deal of through goods traffic is operated by this route. There used also to be through carriages between the Great Northern and Midland lines and the South Eastern and Chatham Railway attached to S.E. & C. express trains at Herne Hill operated by this route. We cannot indicate whether any of these will be revived in the future. The gradient through Snow Hill is partially at 1 in 43.

[Reply to W. K. M.]

Head Codes on Irish Railways.

Mr. J. J. Kennedy points out that Mr. Macartney Robbins is not quite correct in regard to information previously given, so far as the late Dublin and South Eastern Railway is concerned. Mr. Kennedy supplies the following further particulars:—Trains to Bray from Amiens Street and Westland Row, and *vice versa*, carry a round disc (white border and black centre) under the engine chimney by day, and two white lights on buffer-boards by night, whether the trains are express or otherwise. This serves to guide the signalman at Bray to distinguish between a Westland Row and Harcourt Street train, the latter carrying no codes whatever. Trains to Dalkey only, and *vice versa* from Dublin, carry a triangular-shaped disc, painted white, under engine chimney by day, and one white light on buffer-board by night. Trains from and to Carlisle Pier show a white and green light on buffer and the round disc reversed.

[Reply to S. T. C.]

State Railways.

As shown by particulars included in the *Railway Year Book*, as well as indicated by remarks in our Railway Centenary articles, a considerable percentage of the world's railway mileage is State-owned. That is largely due, however, to the fact that, to open up the newer countries, railways had to be constructed by the State, while in other cases the policy has been to make railway construction a State concern. British railways are probably the best equipped and best managed in the world, but the fact that they have been entirely financed by private enterprise, and that in a country already developed the land values and purchase costs generally were heavy even in early days, is one reason why they were unavoidably more expensive than in many other countries. Much of their high reputation is, no doubt, due to the fact that they have been developed under private enterprise.

[Reply to "WAVERLEY."]

Junctions at Llanymynerch.

The line from the Junction situate two chains beyond Llanymynerch station to Nantmawr via Blodwell belonged to the abandoned Potteries Shrewsbury and North Wales Railway, and is worked by the Great Western (late Cambrian). All classes of traffic pass over it for 61 chains, where the late Cambrian Railways branch to Llanfyllin diverges, but only goods and mineral traffic is worked over the remaining portion to Nantmawr, except that for 19 chains at Blodwell, on which section is the station, G.W.R. trains between Porthywaen and Llangynog pass over it. The actual junction for the Nantmawr branch 63 chains from Llanymynerch is probably operated by the key of the tablet for the section, but our information is not definite on the point.

[Reply to A. W. D.]

Answers to Queries.

In view of the many hundreds of enquiries which are sent in, and the fact that a number require research, as also the occasional necessity for holding over replies in view of space considerations, it is obvious that we cannot always reply in the next forthcoming issue, and that at times replies may not be given for several issues ahead. It is but seldom

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however, that any but frivolous enquiries are ignored, though when information desired is given in an article to be published in an early number, it is obviously unnecessary to give the same information in "The Why and the Wherefore" section. Should a reply not appear within, say six months, it would facilitate matters if readers would repeat their enquiries.

[Reply to K. H. S. MASSEY and others.]

Drawgear.

Speaking generally, the draw-hook is attached to a beam connected with the underframe through the drawgear, and usually including springs giving a degree of resilience. In some cases the buffers are also associated, and in other instances the draw-bar passes right through the vehicle, a midway system of springs providing the actual means of connection with the underframe. Both these systems are suggested by your sketches, so that you are not far wrong in your appreciation of the general arrangement. Thanks for your particulars of the new engine shed at Exmouth Junction, Exeter. Obviously, the instance of double-heading noted by you was due to the need for working one of the engines home.

[Reply to K. H. S. MASSEY.]

Switching Out Signal Cabins.

We have no exact information as to the signalling conditions obtaining at Gillingham station as explained by you, but would infer that the signal cabin concerned is switched out probably until required at holiday periods and during the summer months. As a result, the essential signals concerned would be permanently lowered, as for the time being they would be regarded as non-existent, though the lamps would be lighted at night owing to the need for indicating signal positions so as not to confuse enginemen. We have already referred to electric motor vans on the Southern Railway. We are not aware that there is any intention at present to use electric locomotives for S.E. & C.R. electric services.

[Reply to G. E. FENTON.]

Hatfield Branches, G.N.R.

The Hatfield, Hertford, and Luton and Dunstable branches of the late Great Northern Railway received attention in the October and November, 1908, numbers of the RAILWAY MAGAZINE. These branches were originally constructed, respectively, as the Hertford and Welwyn; Luton, Dunstable and Welwyn Junction; and Hertford and St. Albans Railways. The section from Hatfield to Luton was opened in 1855, and thence to Dunstable in 1858. The two Welwyn companies were amalgamated in 1858, afterwards leased to the Great Northern Railway, and eventually purchased outright. The St. Albans branch was opened in 1865, and was also eventually taken over by the G.N.R.

[Reply to A. M. CONYBEARE.]

Punctuality of Expresses.

It must be obvious to you that, whereas it is usually practicable to despatch main line trains punctually, it is the arrivals which are subject to varying conditions which may cause unpunctuality. It may be that delays are experienced *en route*, and now and then an engine may not be in the best of trim, but, speaking generally, the principal causes are overtime spent at stations dealing with luggage or awaiting connections, or the delaying effect of one train running out of course or late upon others. Particulars given of your own records of late arrivals indicate that where a considerable number of minutes were concerned some special occurrence provided the explanation.

[Reply to D. S. FOULKES-ROBERTS.]

Loading Gauges.

It is easy to suggest that bridges, &c., should be constructed to enlarged dimensions when rebuilt, but there are far too many tunnels and overbridges which would restrict increase in height and width to allow of anything substantial being done, beyond increasing the weight-carrying capacity to allow of heavier engines being run. Here and there, "tight" places can be relieved so as to allow standard rolling-stock to run on sections where it was previously prohibited, but little more is practicable. Particulars of permanent way and structure limiting dimensions are included in the "Railway Year Book."

[Reply to K. H. S. MASSEY.]

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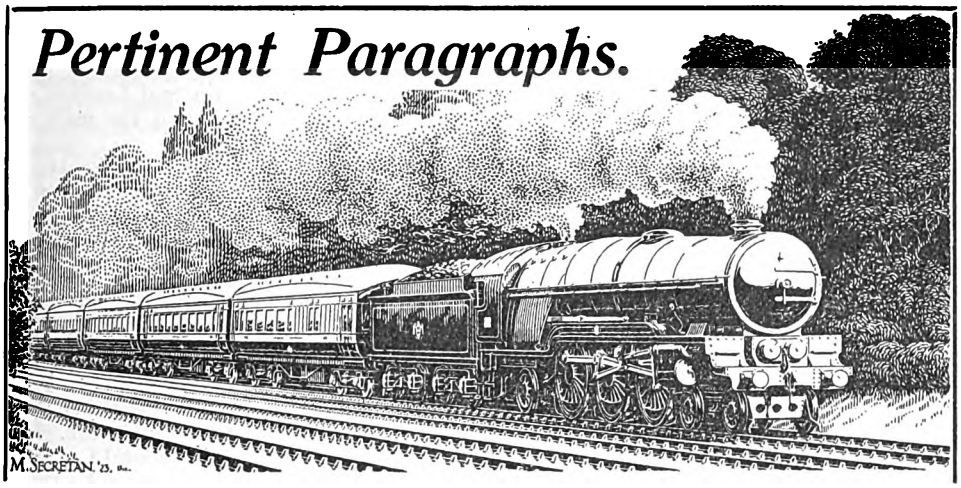
Pertinent Paragraphs.



L.M.S. and L.N.E. Competing Bills.

THE competing proposals of the London Midland & Scottish and the London & North Eastern Railways for serving new collieries in East Nottinghamshire have been abandoned in favour of a joint line, which is to be promoted by the two companies next session. This was decided on April 3, as a result of conferences following a suggestion made on March 26 by the Chairman of the Select Committee of the House of Lords which had had three days' consideration of the main points at issue. An agreement in principle had been arrived at by the two companies by March 31, but they asked for a further adjournment till April 3 in order to settle details. Counsel explained to the Committee on April 3 that it had been found impossible to combine the two schemes, which had been presented to the Committee independently, into one satisfactory joint scheme, and therefore obtained leave to withdraw them, with a view to framing a joint proposal, of which the Notices will appear in the usual way next autumn. Parliament will accordingly not be asked to give a decision as to whether either of the competing schemes was or was not an infringement of the territorial rights granted to the grouped companies under the Railways Act, 1921. It was clear from the expressions used by the Chairman in suggesting the possibility of a joint railway that the Committee regarded the competing points as being very much on the border line between the territories of the two companies. Details of the joint proposal have, of course, still to be worked out, and it would be premature at present to inquire whether the new scheme will include the proposals for removing the crossing on the level of two main lines at Retford which were contained in the L.N.E.R. Bill. On the face of it, there seems no reason at all why these matters, which primarily concern one company alone, should not be dealt with in a separate measure.

A Light Railway Collision.

A CASE rather out of the common was heard recently at the Maidstone Assizes, arising from a collision at a level crossing on the Kent & East Sussex Railway between a train and a motor lorry belonging to a firm of brewers. As the train was approaching the Biddenden level crossing the driver noticed a motor lorry nearing the crossing. The train was stopped and the hooter sounded, but the lorry dashed into the train, lifting the front coach off the rails and causing injuries to passengers, of whom four were the plaintiffs in this action. A claim had previously been made by the brewers against the railway company, but this was dismissed. In the present action four passengers were claiming against both the railway company and the brewers, and the jury returned a verdict against both defendants, awarding £1,250 to one passenger, £500 to another, £347 10s. to a third passenger, and £50 to the fourth. From the proceedings it is clear that each of the defendants accused the other of negligence. For the railway company it was argued that the facts proved excessive speed on the part of the lorry driver, for the train was hardly moving, only having just left the station, whereas the coach was pushed by the lorry a distance of 27 ft. Counsel for the brewers contended that in view of the railway being allowed to cross the road without the erection of gates, the company's servants had not exercised sufficient caution. The erection of a bungalow obscured vision between the drivers of trains and drivers of road vehicles, so that neither could see the other approaching.

The Moffat Tunnel.

A GREAT engineering feat is now being undertaken in Colorado which will have an

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important effect upon the development of the rich natural resources of that State and upon transcontinental transportation. This is the piercing of the great Continental Divide of the Rockies, which here rise some 12,000 ft. above sea level. The Denver, North Western & Pacific Railroad, which was built by David Moffat in the early years of this century under conditions of great difficulty, and which is familiarly known as the Moffat Railroad, connects Denver, the State capital, with the otherwise inaccessible north-western territory and with Utah. The railway has to climb up to the crest of the Divide, and four powerful Mallet locomotives are taxed to the utmost to draw a train of 22 freight cars, representing a weight of about 1,200 tons, up the 4 per cent. gradients which preval for miles, a journey of less than 90 miles taking from 14 to 16 hours, even when uninterrupted by snow-drifts and storms at the summit. Despite long stretches of snow sheds and powerful rotary ploughs, it is estimated that fully 41 per cent. of the cost of operating the road is attributable to fighting snow blockades. North-western Colorado is rich in coal, oil, gold, and other metals and minerals, in agricultural possibilities, scenic beauty and other natural resources. All these would be developed by better communication, and Denver, the capital, and the whole of this territory and Eastern Utah, would be placed in direct communication with the eastern and western seaboard and the Mississippi Valley by the construction of the Moffat tunnel. The tunnel, the contract for which was let in September, 1923, is a State undertaking, the issue of $6,720,000 bonds having been authorised by the Legislature. It will be 6·09 miles long, and will save altogether nearly 200 miles of travel, besides lowering the climb by over 2,400 ft., easing the gradients, and greatly reducing operating costs. Construction is now rapidly proceeding.

L.N.E.R. Musical Society at Queen's Hall.

THAT music of the best quality, rendered in a manner which might be envied by professional talent, can attract and hold a vast audience without any suggestion of playing down to so-called popular fancy, was once again exemplified by the L.N.E.R. Musical Society when, on March 28, there was practically not a vacant seat at Queen's Hall. The occasion was the 129th concert, bringing the 17th season to a triumphant conclusion.

There was but one solo performer, Miss Flora Woodman, though Dr. Stanley Marchant's preliminary organ recital would perhaps entitle him to rank in the same category. Miss Woodman's work was, however, splendidly done, and the encores which followed each appearance were well deserved. As usual, however, principal honours went to the orchestra of 100 and the male voice choir of 300.

Colonel William Johnson Galloway, who has been hon. conductor from the very first and has missed only one of its 129 performances, has every ground for being abundantly proud of the prowess of his players and singers, for it is beyond question that, in very large measure, he himself has been, and is, the impelling force behind them all. The Society as a whole owes a great debt to its executive workers, notably Mr. A. W. Headley, Hon. General Secretary; the Concert Committee, of which Mr. Percy Syder is Chairman; the General Committee of the Society, of which Mr. A. Wilson, Divisional General Manager, Southern Area, L.N.E.R., is Chairman, and Mr. Syder Deputy Chairman; the President, Mr. William Whitelaw, and the Deputy President, Lord Faringdon; the vice-presidents; the divisional committees and secretaries, professors, accompanists and librarians; the concert stewards and programme sellers, and the Hon. Ticket Steward, Mr. S. A. Jarvis.

The Society was established in 1908, and is an instance of the interest taken by the company in the social well-being of the employees. It comprises a full orchestra of 100, and a male voice choir of 300. The orchestra is composed of members of the staff employed in London and immediate vicinity; the choir is drawn from wider fields, and is formed of contingents from London, Cambridge, Grimsby, Ipswich, King's Lynn, Norwich, Peterborough, York, &c.

Among the distinguished company present on March 28 were several directors and practically all the chief officers, together with visitors from other railway companies, &c.

Mr. Alex. Wilson, in proposing a vote of thanks to Mr. Whitelaw for presiding that evening, said that rather more than two years ago their Chairman came south and was regarded by everyone as one of Scotland's best. He took a very deep interest in the welfare of the staff. In fact, he took a keen interest in every detail of railway work.

Mr. Whitelaw, in replying, said these musical entertainments were among the few happy things they had on the railway in these days. What with falling traffics and other troubles, they needed cheering up from time to time. However, he was glad to see that Sheffield United was in the Cup Final, so his line would have the opportunity of running plenty of excursions to Wembley, as he had no doubt his friend Mr. Nicholls would be doing from Cardiff.

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Continuing, he thanked Colonel Galloway and the choir and orchestra for the magnificent entertainment, which had meant for the performers a tremendous lot of hard work. He was looking forward to June 26, when the L. & N.E.R. would entertain delegates from all the world's railways, in connection with the International Railway Congress, at a concert in the Queen's Hall, provided by the Society. He had more than once expressed a strong wish that the Society should give a concert in Edinburgh, and he would not be satisfied until they had done so.

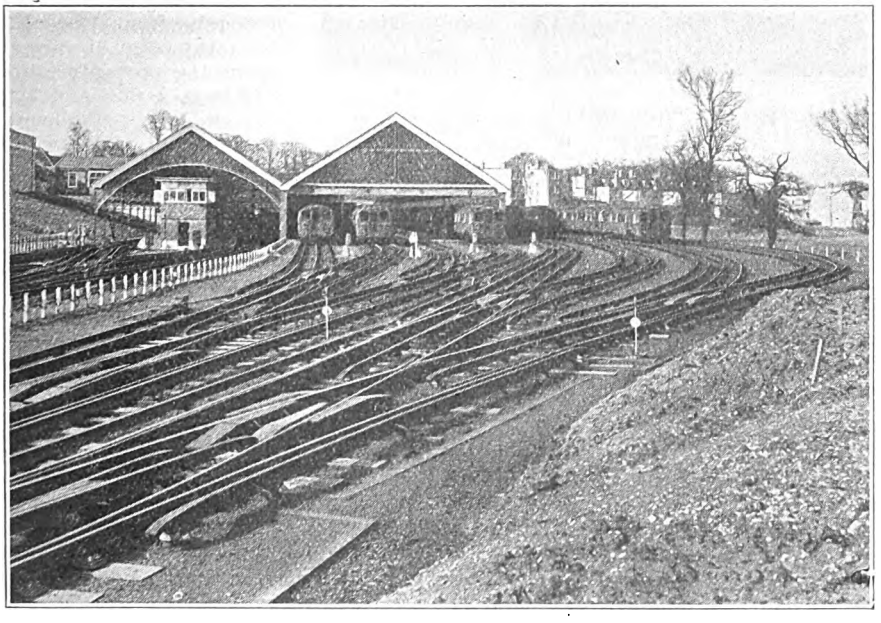
Traffic Records, S.R.

A STATEMENT was recently issued in regard to train running on the Southern Railway. It was pointed out that the total mileage of all Southern Railway trains in January and February, 1925, was 7,886,783 miles; 113,709 steam trains were run on weekdays in February, 1925, and of this total 93 per cent. were to time, or were less than five minutes late, leaving 5 per cent. under 10 minutes late and 2 per cent. over that margin. This includes all steam suburban Southern Railway trains, carrying one of the heaviest daily traffics in the world.

In connection with the new electric service now open from Victoria to Coulsdon North and Sutton, the number of trains into Victoria station has been increased from 840 to 1,000 per day. The figures show plainly that a very great improvement has been made in regard to train punctuality and reliability. The figures given are all the more striking when it is realised that in the case of Cannon Street, out of 335 passenger trains in and out in 24 hours, no less than 153 are concentrated in the rush hour periods. Roughly, 500,000 passengers arrive and depart at all Southern Railway terminal stations during 24 hours, and it is claimed that more trains are operated in and out of Waterloo station than any other station in this country.

Further "Underground" Developments.

To facilitate the operation of increased train services, it has become necessary to make various additions and rearrangements to the equipment of certain sub-stations that are at present susceptible to overload or will be in the near future. At Victoria a new 2,000-kw. rotary converter will replace one of the existing 1,200-kw. machines, which will be transferred to Russell Square. A new 1,500-kw. rotary will be installed at Baker Street, this addition necessitating an enlargement of the sub-station building; and the Bond Street equipment will be augmented by the transfer of a 900-kw. rotary from Wood Lane. At Lots Road, ten high-tension "group" switches, controlling the supply of current to the sub-stations, are to be replaced by switches of modern type and improved design. To augment the supply of air for signalling purposes, 12 new



CARRIAGE SHEDS AND COMPLETED STATION AND TRACK WORK AT EDGWARE, LONDON ELECTRIC RAILWAY.

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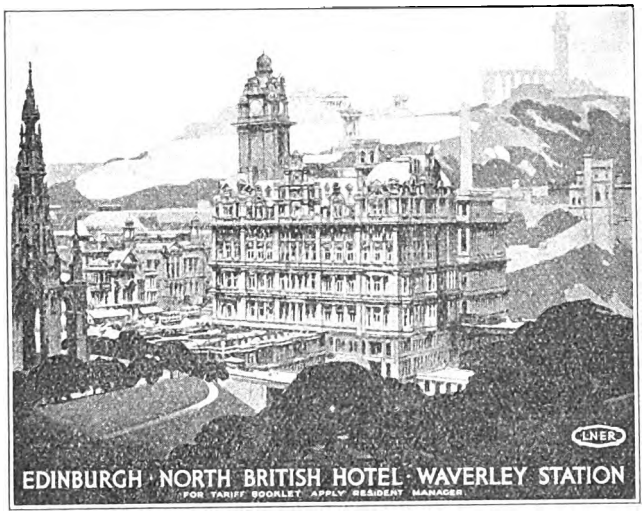

"NORTH BRITISH STATION HOTEL" POSTER, L.N.E.R.

compressors are to be installed—two on the District line (at Ravenscourt Park sub-station), five on the London Electric Railway (two at Russell Square, two at Kentish Town and one at Baker Street), and five on the Central London Railway (two at Notting Hill Gate, two at Bond Street, and one at Shepherd's Bush).

The extension of the Hampstead Railway to Edgware, and the consequent increase in rolling-stock requirements, has made it necessary to provide ample and up-to-date terminal accommodation. In order to allow for the needful flexibility of movement and economy in operation, it has been found desirable to install eight sidings, each 400 ft. long, in addition to the two platform roads which are also used for stabling trains during slack periods and at night. The total length of sidings is now 3,831 ft., which provides stabling accommodation for 76 cars. The sidings are provided with current rails throughout, and are track-circuited and signalled, and are under the entire control of the passenger station signalman. Thus the usual manual shunting operations customary in nearly all shunting yards are eliminated. Four of the sidings are under cover, and are provided with specially-designed inspection pits, the first of their kind in or around London. These pits are provided with a double ledge on each side on which the carriage repairer may stand, thus greatly facilitating inspection work and lifting the weighty equipment to the underside of cars. The car shed is also equipped with an overhead trolley cable, which enables the rolling-stock to be moved over the inspection pits, and at the same time gives freedom of movement to the inspecting and examining staff. In this system the use of shunting locomotives, either of steam or battery type, has been obviated.

New L.N.E.R. Picture Posters.

Two of a very striking series of coloured picture posters just issued by the London & North Eastern Railway Company are reproduced, one on this page and the other on page 405. Regarded as a whole, the collection may be set down as quite excellent. The two selected for reproduction are, perhaps, the least startling of the series—chromatically speaking, that is—though from the RAILWAY MAGAZINE point of view they are among the most interesting. One of these is a fine and large portrait of George Stephenson, the work of Mr. Andrew Johnson, the exhibition of which will have a distinct appropriateness in view of the forthcoming railway centenary celebrations; the other is a remarkably clever view of the North British Hotel, Waverley station, Edinburgh, which is from the brush of Mr. Fred Taylor. The picture is full of fine detail, besides being a happy combination of colour, the green and blue and grey of the background being exceedingly effective.

Space does not admit of a detailed account of the remaining posters, most of which are obviously designed specially to attract the holiday maker. But special reference should certainly be made of Mr. Fred Taylor's view of Piccadilly Circus in its night guise, with the graceful figure of Eros—now, alas! conspicuous by its absence—silhouetted in the immediate foreground. The extent and variety of the remaining posters may be gathered from the following bare mention thereof, viz.: The Yorkshire Coast, East Coast Resorts, Scarborough, East Coast by L.N.E.R. (three bathing scenes), Felixstowe, North Berwick, the Trossachs, York, Dunbar, Cruden Bay, Dovercourt, Belgium, Bulb Time in Holland, and Hamburg.

The Owencarrow Viaduct Disaster.

MR. BATCHEN's report to the Department of Industry and Commerce, Irish Free State, on the cause of a train being overthrown in a gale whilst crossing Owencarrow Viaduct, on January 30, throws a new light on the subject. The first vehicle to leave the rails was the second passenger coach—the third vehicle from the engine. That left the road whilst crossing the viaduct, and its side was dragged for some distance

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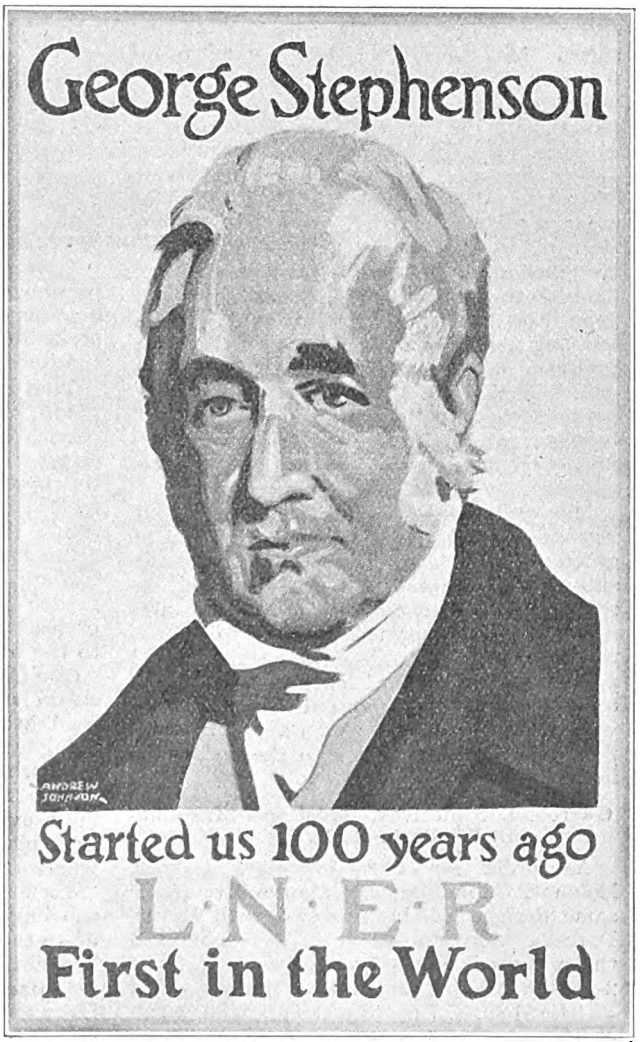
along the parapet which is 5 ft. high above rail level. As for the whole length of the viaduct there is a guard rail, raised to 2½ in. above the level of the running rail, it is evident that the initial derailment was not, as suggested, due to the absence of a guard rail. The preceding coach apparently did not leave the rails until later; that would seem to have happened in the space of 47 ft. between the viaduct and the parapet wall, 19 in. high, of two masonry arches in the 134 yards of embankment following the viaduct. The coroner's jury recommended that the "protecting railing" should extend from cutting to cutting, but this cannot be done on the embankment as it is only 12 ft. wide at formation level. All that Mr. Batchen recommends is the provision of two anemometers of the Dines type. These record not only the average wind velocity but also the velocity in gusts, and it is urged that when the wind reaches a velocity that is dangerous to trains all traffic on the line should cease.

Developments at Crewe Works, L.M.S.R.

THE London Midland and Scottish Railway have decided to carry out an elaborate scheme of alteration and building at their Crewe locomotive works. Plans have already been passed, and the work, which will provide employment for a great number of men, is to begin immediately. The scheme is largely the outcome of the increased size and weight of modern locomotives. Engines which have become out of date are being broken up and replaced by others more powerful and economical, which need larger plant and appliances for their maintenance and workshop handling. At the present time these works can turn out every year, amongst other things, 70 new engines, and can deal with 1,200 "heavy repair" jobs. When the improved arrangements have been completed these figures will be increased in many respects by nearly 50 per cent. The old erecting shops are to be reorganised and provided with high-speed electric cranes, while a big new erecting shop—to be known as "No. 10"— will be built. The task of providing new boilers in sufficient quantities to meet demands has of recent years become a difficult problem, and in order to deal with this the "old works" are being converted into a boiler-building shop. Included also in the scheme are the remodelling of the steel plant and the introduction of newer types of appliances. Old furnaces are being pulled down and replaced by others larger and more up to date. The alterations, which will entail an expenditure of nearly £500,000, are aimed to make the Crewe works the most efficient railway works in the country.

A Defective Crossing Derailment.

ON January 4 last, as the 12.30 p.m. express passenger train from Liverpool to



"GEORGE STEPHENSON" POSTER, L.N.E.R.

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Manchester and York was passing through Lostock Junction station, L.M S.R., the tender of the engine and the first nine vehicles left the rails. The train was brought to a standstill, with all vehicles in an upright position, after travelling a distance of about 120 yards. Ten passengers complained of slight injury or the effects of shock. The train was hauled by 4-4-2 engine 1422 with six-wheeled tender, and included ten vehicles, the engine and tender weighing 89 tons 8 cwt. in working order, and the coaching stock 223 tons. After the train came to rest, the tender of the engine and the first nine vehicles were found to be derailed, the wheels of the last vehicle being on the rails. The train was divided between the fifth and sixth (Nos. 2923 and 257) vehicles owing to disconnection of the screw coupling. Considerable damage resulted from the derailment to the bogie frames, springs, &c. ; axle-boxes and guards ; wheels, buffer-rods, brake rigging, end panels, and footboards of the first nine vehicles.

The permanent way over a length of about 160 yards suffered in the way of breakage of a large number of chairs, bent wing rails, sleepers and fastenings broken and bent. No telescoping of stock, and no breakage or damage to gas cylinders or pipes resulted from the accident. It appears that a relaying gang had been working at the junction on the morning of the accident, and Colonel Sir J. W. Pringle comes to the opinion that the condition of the "V" crossing, when the express train was permitted to pass over it, was the cause of this accident.

His conclusion is that the derailment was caused by the use of a wing rail of greater depth than was justifiable, and the sub-inspector concerned is regarded as responsible to that extent. Criticism is also made of the arrangement adopted to protect the scene of working to ensure trains would pass only at reduced speed, though the opinion is further expressed that the train was not travelling more than about 15 miles per hour, thus agreeing with the restriction in force.

Garratt Locomotives, Beira and Mashonaland and Rhodesia Railways.

An order for a further eight Garratt locomotives, making a total of twelve of the same design, has been placed with Beyer, Peacock & Co., the whole to be delivered in the autumn. These locomotives are of the 2-6-2-2-6-2 type, and have a tractive effort of 34,560 lb. (75 per cent. b.p.), and weigh approximately 120 tons. The maximum axle load will be 13 tons.

It is understood that these locomotives are for service on the Villa Machado-Umtali section of the Mashonaland Railways. The ruling gradient is 1 in 50 uncompensated, the sharpest curves, of which there are a good many, having a radius of 5 chains. The rails have a weight of 60 lb. per yard, the gauge being the standard of South Africa, namely, 3 ft. 6 in.

The engines will be built to the inspection of Sir Douglas Fox & Partners, Consulting Engineers to the Rhodesian Railways.

The following are the chief leading dimensions :—

Cylinders	16 in. diam. by 24 in. stroke.
Diameter of coupled wheels	4 ft.
Boiler pressure	180 lb.
Grate area	39 sq. ft.
Total heating surface ..	2,250 sq. ft.

The rigid wheelbase will be 8 ft. 9 in.

The firebox will be of copper, and the boiler will be fitted with superheater. Seven tons of coal will be carried, and 4,350 gallons of water, and in view of the particularly sandy nature of the country through which these railways pass, the motion will be boxed in.

Feed Water Heating on the L.M.S.R.

One of Mr. Hughes' 4-6-0 superheated passenger engines is being equipped with a new type of feed pump and direct-contact preheater marketed by Messrs. Vickers Limited.

The new device consists of a two-stage pump, having horizontally-opposed rams coupled to a common crosshead, with a direct-contact preheater interposed between the two stages. The rams are given their reciprocating motion by means of a rocking lever, the end of which is coupled by a driving rod to a return crank fixed on the trailing crank pin. Cold water from the tender is forced by one pump through the preheater to the other pump and thence to the boiler. As in the case of the exhaust steam injector, a branch pipe for the exhaust steam is taken from the blast pipe, the steam used being about 15 per cent. of the total going away to exhaust.

There are several features which should enable this type of pump to compete on more even terms with the injector. In the first place, it is driven from the driving wheel of the engine and is thus worked "expansively," or at the same cut-off as the engine. The extra power required to drive the pump is supplied directly from the locomotive cylinders. The usual form of feed pump, it should be remembered, having its own steam unit, works "non-expansively," and it is this "steam end" which is responsible for most of the maintenance expenditure at the running sheds. In the second place,

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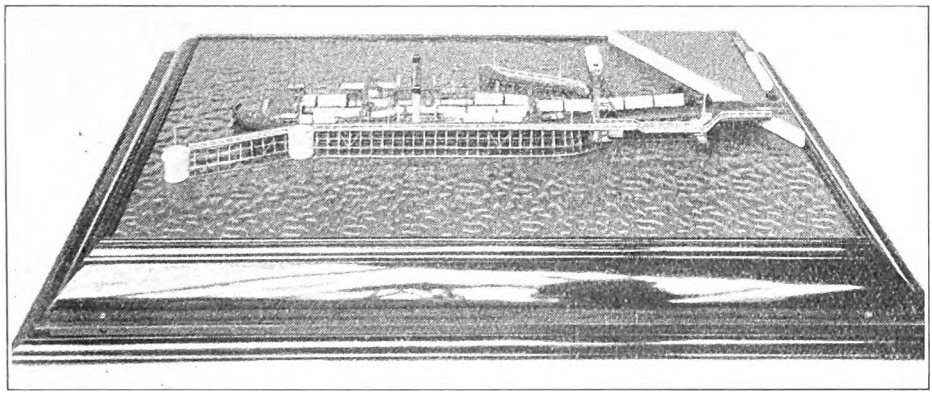
the exhaust steam, after passing through a separator, comes into actual contact with the feed water, and thus radiation losses are largely eliminated.

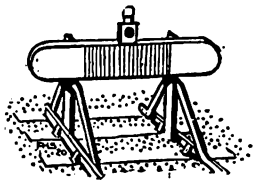
The control of the pump, which is largely automatic in action, is worthy of note. A by-pass valve, coupled to a pipe leading back to the tender, is attached to the delivery of the cold-water pump. This valve has its control attached to the reversing shaft of the engine, and is arranged so that different degrees of valve-opening correspond to different percentages cut off, thus making the feed water supply approximately equal to the boiler demand at all times.

Harwich-Zeebrugge Train Ferry Model.

A MODEL of more than usual interest has just been completed by the well-known model makers, Bassett-Lowke Limited, of Northampton. This is a very small exhibition model of the train ferry which now runs daily, except Sundays, between the London and North Eastern Railway Company's land terminal at Harwich and a similar terminal at Zeebrugge. The model is intended for advertising purposes, and it was necessary to condense the scale somewhat in order to make the complete model in show-case small enough to be easily shown in the window or office of any agency of the company responsible for the service. The scale to which the model is made is $\frac{1}{16}$ in. = 1 ft., and the glass sea covers only 3 ft. 4 in. in length by 1 ft. 7 in. wide. The ferry boat itself is about 22 in. long, with a beam of $3\frac{1}{2}$ in., and fits snugly into the berth, which is girder built and has one short and one long arm. The accompanying photograph gives a very good general view of the whole lay-out, including a small portion of the dock side, but a photograph of such a small model naturally does not show up all the details which it has been possible to include. The ferry proper has two main tracks and two sidings, which accommodate a full complement of merchandise-carrying vehicles, principally the ventilated produce wagons of large dimensions and usually a few of the 43-ton open trucks which are used for the transport of large and heavy machinery, &c.



BASSETT-LOWKE MODEL OF TRAIN FERRY.



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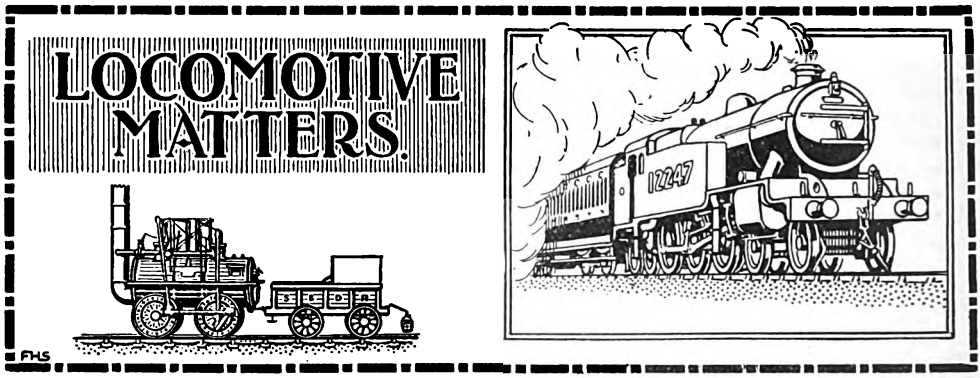

Under this heading will be inserted short references to news items relating to locomotive engines and their duties. It must be understood, however, that information as to the stations of particular engines cannot be given, for the reason that, before the date of publication, transfers may have taken place, while lists of engines, &c., debarred from "The Why and the Wherefore" section, cannot be included under this heading. With this understanding, notes as to matters thought to be of general interest will be welcomed.

L.M.S.R.

THE new Bradford Exchange–St. Pancras restaurant-car express, which commenced running on March 2, is hauled daily by a Midland 4-4-0 compound class engine. This is the first Midland division locomotive to work regularly into Bradford Exchange station, all other trains of this division being worked between Bradford and Sheffield by late Lancashire and Yorkshire engines. A number of L.N.W. "Prince of Wales" class engines, including Nos. 1100 and 5814, have made their appearance in the Bradford district and take turns with the Horwich-built engines of the same wheel arrangement in hauling the main-line trains. Goods traffic in this district is exceptionally heavy and is handled chiefly by the large-boilered 0-8-0 tender locomotives of the L. & Y. type. Among the engines shedded at Low Moor depot there are L. & Y. 0-8-0, 0-6-0, 4-6-0, 4-4-2, 4-4-0, 0-8-2T, 0-6-2T, 0-6-0T, and 2-4-2T, L.N.W. 4-6-0, and a Midland compound 4-4-0 No. 1036.—[A. P. HERBERT.]

Named engines stabled at Huddersfield (20) shed include: Nos. 165, *City of Lichfield*, 372 *Belgic*, 1413 *Henry Cort*, 1418 *Cheshire*, 1498 *Thomas Savery*, and 1989 *Lady of the Lake*. All the foregoing are 4-6-0 non-superheated "Experiment" class. No. 5600 *Prince of Wales* has had the name-plates replaced.—[A. C. BUREAU.]

The following L. & Y. engines are at Wigan, L.N.W. shed: Nos. 1351 (0-8-0), 386, 1059, and 1193 (0-6-0's), 12767 (0-8-0, compound), and Caledonian 0-6-0 No. 292. Midland "single" engines, Nos. 615, 617, 618 and 647, have been scrapped. No. 765, a Midland 4-4-0, has been employed on the Oxford and Cambridge branches from Bletchley, while a G. & S.W. 0-6-0 No. 51 was noted recently on a goods train at Derby.—[HAMILTON BANTOCK, S. KERR, "MANCHESTER READER," R. D. NOLDREY, and J. TWELLS.]

Caledonian 0-4-4T, No. 1172, built 1885, is now scrapped. Engines recently out of Perth repair shops in the new colours include 4-4-0 No. 14478, formerly No. 73; 0-6-0 No. 17467, old No. 764; and 0-4-4T No. 15213, old No. 157. An outside cylinder 4-4-0 engine, No. 14100, previously No. 1179, is employed in the Dundee district. No. 14, a 0-4-4T, is at present in the shops having the condensing apparatus removed. Superheated 4-4-0's Nos. 894, 898, 923 and 924 are now L.M.S. Nos. 14434, 14437, 14438 and 1439 respectively, also unsuperheated 4-4-0's Nos. 888 and 145 are now 14338 and 14354.—[J. A. HODGE and R. A. READ.]

Highland section "Loch" class locomotives Nos. 121 *Loch Ericht*, 130 *Loch Fannich* (L.M.S. No. 14390), and 131 *Loch Shin* have been fitted at Lochgorm Works with standard Caledonian boilers from St. Rollox. They are employed between Inverness and Wick.—[J. H. C.]

Several Midland "single" engines attached to Leicester shed handle the through trains between Northampton and Leicester. Engines recently noted on these duties were Nos. 649, 651, 654 and 655. Johnson "singles" still working in the Birmingham district are Nos. 669–673, all shedded at Birmingham; 674, 676–678 at Gloucester; and 680, 682 and 683 at Bristol.—[HAMILTON BANTOCK and D. H. DEW.]

A further seven of the new Horwich-built four-cylinder 4-6-0's have been sent to work on the L.N.W. section. They are numbered from 10465 to 10471. This series (Nos. 10455–10474) are being constructed with a grate area of 29·6 sq. ft., and with an increased bogie wheelbase. For the time being, they

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are to be turned out plain black, with the number on the cab sides. With the advent of these engines (series 10455–10474), the following locomotives of the same type which have been working on the L.N.W. section have been returned to the L. & Y. system: Nos. 10433 (shed 32), 10439 (shed 17), 10449 (shed 30), 10452, 1671 (shed 1), and 1672 (shed 1). When engines of this type, remaining unpainted, are returned to the L. & Y. section, the large 40-ton tenders are replaced by smaller tenders, sometimes off the old 1510 class, and sometimes spare 0-6-0 engine tenders. A large eight-wheeled 0-8-0 goods engine tender has been running behind 4-6-0 No. 1652 (shed 32).—[CLIFFORD MARSHALL.]

Midland 0–6–4 tank No. 2014 is among the latest of this class to receive a Belpaire boiler and superheater. Together with No. 2032, she is shedded at Bournville (Birmingham). New Belpaire boilers have also been put into Johnson 2-4-0's Nos. 158, 167 and 177. The first two are at Worcester depot and the latter at Saltley (Birmingham). One of the new 0-6-0T locomotives, No. 7107, built by the Vulcan Foundry Co. (works No. 3724, 1924) is temporarily stationed at Bromsgrove (Worcester), to which shed No. 2290 the 0-10-0 banking engine has now been returned. The following Midland compounds have been working to Birmingham and the West of England line—Nos. 1048, 1049, 1052, 1053, 1058, 1069, 1074, 1079, 1081, 1082 and 1084. No. 1074 is fitted with Weir feed-pump and heater.—[HAMILTON BANTOCK and "JANITOR."]

G. & S.W. section 0-4-2 Stirling locomotive, No. 657, formerly employed on the Mayfield Colliery line, has been sent to Kilmarnock for scrapping. Built in 1865 as No. 150, this was the oldest engine at work on the G. & S.W. section.—[X.]

The second and final series of 4-6-0 passenger engines of L. & Y. design is now at work on the L. & N.W. section, Nos. 10465 to 10474 inclusive. These engines, like the preceding batch, have been turned out unpainted, and with the number in small yellow figures at the top of the cab side sheets. Of the earlier engines of the same type originally allotted to this section, only one or two now remain (*e.g.*, 10454), the others having returned to their own section. Nos. 7143 to 7149 are new 0-6-0 shunting tanks ("7100" class) recently delivered by the Hunslet Engine Co. Ltd., of Leeds, thus completing the present order for engines of that type. The 50 engines of this class are allocated as follows: Midland Division, Nos. 7100 to 7119; Western Division "A" (old L. & N.W.), Nos. 7120 to 7124, 7135 to 7149; and Northern Division, Nos. 7125 to 7134. Of these, Nos. 7100 to 7119 were built by the Vulcan Foundry Co. Ltd., Nos. 7120 to 7134 by the North British Locomotive Co. Ltd., and Nos. 7135 to 7149 by the Hunslet Engine Co. Ltd. Further Midland type goods engines have been completed at Crewe, the latest to appear from the shops being No. 4112.

Nos. 1433 *Daphne* and 2061 *Eglinton*, both of the 4-4-0 "Precursor" class, have been converted to "George the Fifth" class (superheaters), as also has No. 2579 *Ganymede* of the same type, but with the addition of a Belpaire boiler. Recent conversions to class "G1" (superheater) are as follows: Nos. 1190, 1895, and 1299 (formerly class "G" simples), and No. 647 (formerly class "F" compound), all of which have been provided with Belpaire boilers, also the vacuum brake with two sacks and carriage-heating apparatus. The following additional engines are now running fitted with standard Belpaire boilers: "Prince of Wales" class: Nos. 27, 146, 277, 293, 444, 497, 707, 2040 and 5795 (old 284); "George V" class: Nos. 300, 789, and 1218; "Precursor" class (superheater); No. 5275 (old 1439); "G1" class: Nos. 329, 1214, 1217, 2371, 2376 and 2410; "18" goods class: Nos. 47, 87, 166, 349, 350, 399, 416, 420, 450, 451, 488, 530, 547, 625, 715, 836, 1130, 1695 and 1773.

"Prince of Wales" class engine No. 964 *Bret Harte* (Walschaerts motion) has also been fitted with a standard boiler, and is now similar to No. 5845, which was exhibited at Wembley last year. The ex-N.L.R. 4-4-0 inside cylinder tank engines Nos. 2648, 2649, and 2874 (old N.L. Nos. 114, 117, and 109 respectively) have been withdrawn for scrap. One of these engines, No. 2874, was illustrated on page 299 of the April RAILWAY MAGAZINE, which is of exceptional interest in view of the fact that the type to which it belonged is now extinct. One of the "Renown" class engines is being broken up. No. 1974 has just been turned again as a compound and with superheater. This and 1944 are the only two compound passenger engines now left. 1966 is in the works and will be either scrapped or converted to a "Renown."—[C. WILLIAMS.]

L.N.E.R.

L.N.E.R. "Pacific" locomotive No. 4473 recently worked on several days express trains on the Manchester–London main line of the Great Central section. On March 27 it was used for an Aintree special as between London and Sheffield.—[C. J. WOODNUT.]

G.C. 4-4-2 locomotive No. 1085, stationed at Woodford (G.C.), has been equipped with a G.N. pattern chimney and bogie, also altered cab, "pop" safety-valves and

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reduced dome. G.N. engines working on the G.C. section include Nos. 950, 4420, 4449, 1456, of the "Atlantic" type, and No. 4652, a "Mogul" goods engine. No. 412, a N.E. 0-6-0, is also on this section.—[J. TWELLS.]

Further ex-R.O.D. 2-8-0's are on the G.N. section, including Nos. 6270, 6279, 6299, 6308, 6311 and 6318. Among other engines recently noted on this section have been G.C. 2-8-0's Nos. 406 and 407, and 4-6-0's Nos. 6097 and 6098, G.E. 0-6-0 No. 8290 and 4-4-0's Nos. 1829E. 1894E, 8892 and 8849. This latter engine was hauling the Royal train.

The latest "Pacifics" are shedded as follows:—No. 2553 at King's Cross, No. 2554 and 2555 *Centenary* at Doncaster, and No. 2556 at Grantham. Further, Darlington-built three cylinder 2-6-0's have been sent on to the G.N. section, including Nos. 120 and 124. The former is at Peterborough shed. No. 4405, an "Atlantic" engine has been fitted with Ross "Pop" safety-valves.—["IRON HORSE" and J. R. WHITTLE.]

An interesting group of locomotives was seen at King's Cross (No. 5 platform) on one occasion during last December. The engines were:—G.E. 4-4-0, "Claud" class, No. 1894E, G.N. 4-4-0 No. 4336, G.N. "Atlantic" No. 4408, G.C. 4-6-0 No. 6168, *Lord Stuart of Wortley*, and G.N. 0-6-0 "mixed traffic" class No. 3003.

G.E. section locomotives are working the 10.5 a.m. York to Hull express, returning on a fish train. Rebuilt 4-4-0 No. 1039 and 4-6-0 No. 1561 are the engines concerned, the latter recently having been in the charge of a G.C. driver. Of the three locomotives whose work was compared on the Grimsby-Manchester fish train, as regards coal consumption the result was as follows:—N.E. three-cylinder 4-6-0, G.C. four-cylinder 4-6-0, and G.N. three-cylinder 4-6-2. It is said that the N.E. locomotive kept the best time.—[T. H. KIRK.]

It is understood that the whole of the 1923 batch of G.N. "Pacifics," Nos. 4472-4481, are to receive names. No. 4475 of this class has been named *Flying Fox*, and is the engine selected to run on the G.W.R. during April.

The feedwater pump fitted to 2-8-0 No. 3476 is of the Worthington type and not a Weir, as reported in these columns last month.

No. 4472 *Flying Scotsman*, did not have its name plates removed, as stated last month. What happened was that the plates were taken off for reburnishing during a day or two.—[J. F. G.]

N.E. section 4-6-0 No. 2009 and G.C. 4-6-0 No. 195 have been noted at King's Cross.—["IRON HORSE" and R. D. NOLDREY.]

G.E. section locomotives Nos. 911, 912 and 2374 have been working goods trains on the G.C. section.—["MANCHESTER READER."]

N.E. three-cylinder "Pacific" locomotive No. 2401 has just been through the shops and is now running with a Westinghouse-Vacuum brake ejector in place of the former Gresham and Craven pattern.

Darlington-built three-cylinder 2-6-0 engines, Nos. 39, 52, 143 and 167 are at York, also 0-6-0T No. 290. This latter engine has the original square cab and the number plate bears the inscription: "Rebuilt York Works 1899." One of the only two class H1 0-6-0T crane engines No. 590 is working as shed pilot at York. No. 1680 is the latest class V to come from Heaton Junction to York.—[P. RANSOME WALLIS.]

No. 33, the first of the N.E. series of three-cylinder "Moguls," is to be seen frequently at Tweedmouth sheds. Nos. 36 and 39 have also been there. An express goods from Edinburgh to Tweedmouth has been worked on different occasions by N.B. 4-4-0 No. 9361 *Vich Ian Vohr*, N.E. 4-4-2 No. 700, and G.N. 4-4-0 No. 3061. Two 0-6-2T's and some 4-4-0's of G.N. design have passed through Berwick *en route* for Scotland. The Berwickshire services formerly operated by N.B. 2-4-0 locomotives are now dealt with by old N.E. locomotives, Nos. 223, a 4-4-0, and 455, a 0-6-0. Recent rebuildings at Cowlairs, include 0-6-2T No 9911.—["A BORDER READER."]

New "Director" class engines work the bulk of the L.N.E.R. trains on the Edinburgh to Perth services. Among those noted at Perth are Nos. 6387, 6388, 6389, 6390, and 6391. G.N. type 0-6-2T No. 2586, one of the Beyer-Peacock 2583-2594 series, has been working in the Edinburgh district, while N.E. 0-6-0 No. 1900D is at Haymarket. Further, N.B. class D 0-6-0T's which have been rebuilt are Nos. 9817 and 9830. The name *Rheims* has been removed from N.B. 0-6-0 engine No. 9676.—[J. A. HODGE and R. A. READ.]

Engines of the G.N. 0-6-0 "mixed traffic" or 0-6-2T types are used to haul the 11.20 a.m. Bradford to King's Cross Pullman Car Express as far as Leeds Central, and in the reverse direction 0-6-2T's are used from Leeds. No tender locomotives of the L.N.E.R. work into Bradford Exchange other than those of the six-coupled "mixed traffic" class. The ordinary expresses to King's Cross are mostly hauled by 4-4-2 or 0-6-2T engines. The Bradford to Marylebone expresses are worked between Sheffield and

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Marylebone by locomotives of the G.C. "Director" class.—[A. P. HERBERT.]

Gresley "Pacifics" of the 2540 series are sometimes to be seen working Cheshire Lines trains between Manchester (Central) and Chester (Northgate). They are fitted with shortened chimneys and domes. During February No. 2555 *Centenary* and 2556 were noticed at Chorlton (C.L.C. Rly.), and No. 2553 on the Manchester, South Junction and Altrincham Railway at Stretford.—[J. E. HAMMOND and M. G. PIERSON.]

N.E. 4-6-0 engine No. 911, until recently, has been stabled at Gorton depot, and has worked Manchester–Sheffield slow trains, and locals to Marple. Other N.E. section locomotives seen in the Manchester area are: 4-6-0's Nos. 761, 788, 799, 817, 822, 908, 911, 921, 924, 2368 and 2374, together with 0-8-0's Nos. 763, 764 and 1215. The 0-6-2T's built by Beyer Peacock and Co. for service on the N.B. section are being "run into condition" at Gorton. So far, Nos. 2583 to 2590 of this batch are running. Two of the G.N. "Pacifics," Nos. 2555 *Centenary* and 2556, have now been transferred from Gorton sheds. G.C. 4-6-0 engine No. 6165 *Valour* has not yet returned to the G.N. section, and is regularly working from Gorton. G.N. 0-6-0 No. 3522, fitted with the double-dome boiler, was recently seen in the Manchester district. The smaller 4-4-0 type engines used on Liverpool to Manchester services are having their domes reduced and N.B. pattern chimneys fitted. No. 6200, a 2-8-0, has been similarly treated. 2-4-0T No. 450 B (G.C. section) was scrapped at Gorton and not at Stratford, as stated in error by a previous correspondent.—[C. J. WOODNUTT.]

G.W.R.

T.V. 0-6-2T locomotive (Class A), No. 120, has been rebuilt at Swindon with a standard boiler and fittings, new cab and bunker. The original frames and motion are retained; but the valve travel has been slightly shortened. It now carries the No. 441. Others of the same class have had new bunkers and the cab fittings reversed for right-hand driving, the original boilers being unchanged.

On the Barry section, one of the outside-cylindered 0-6-2T's, built in America in 1900, has been rebuilt with a Swindon boiler and the frames have been lengthened to allow for a radial axle. The engine now resembles a G.W. "Prairie" class, 2-6-2 engine.—[H. T. HOBBS.]

S.R.

L.S.W. section 4-4-0 locomotive No. 314E of the Drummond small boilered class, rebuilt with extended smokebox by Urie, has been working on the S.E. & C. section, and was in evidence recently on the 9.50 a.m. Victoria and Dover via Maidstone East train. Since then she has been used on the 9 a.m. Margate–London express, and also, together with "Brighton" section 4-4-0's Nos. 208 and 211, on Brighton to Ashford trains via Hastings. Other 4-4-0's of the same class from the L.S.W. section, Nos. 304E and 310E, have also been working over the S.E. & C. section. Large boilered S.E. & C. 4-4-0 No. 775 recently worked on local train duties over the Dover–Faversham line. Previously this class of engine had not been permitted on the L.C. & D. section. It is customary for all the 4-4-0 rebuilds, after leaving Ashford shops, to be run into condition on local trains between Ashford, Tonbridge, and Maidstone West, and also Ashford to Cannon Street turns. Nos. 489 and 747 have lately been so employed. No. 790A, the 2-6-4T, regularly hauls the 3.30 a.m. and 4.36 p.m. Cannon Street to Dover trains.—[S. C. HAWTREY, L. J. SLATTER, and J. L. SUTCLIFFE.]

Domeless boiler engines of the S.E. & C. section recently noted at Redhill include: 4-4-0's Nos. 13, 34, and 441, on the 5.17 p.m. train from Redhill to Charing Cross, 0-6-0 goods engines Nos. 15 and 96, and a 0-6-0T. An L.S.W. section 4-6-0 of the "740" class was seen outside Bricklayer's Arms running shed, S.E. & C. section. For some time past an L.B.S.C. section class E1 0-6-0T has been stationed at Redhill, S.E. & C. locomotive depot, and employed on pilot duties at that station. 0-6-2T No. 404B of the "Brighton" section has been working regularly a morning Tonbridge to London Bridge via Edenbridge (S.E.) and Oxted train, returning to Tonbridge by way of Redhill. S.E. section trains running over the Brighton section Tunbridge Wells West to London Bridge via Oxted are hauled by Sterling rebuilt 7-ft. 4-4-0's.—[R. D. NOLDREY and O. W. POTTER.]

On the L.B.S.C. section Stroudley 0-4-2 No. 173 *Cottesloe* has been scrapped at Brighton. 0-6-0 goods engines Nos. 443 and 521 are among the latest of the class to receive larger boilers with the new design domes, shortened in order to clear the S.E. & C. section loading gauge. No. 424 of the "Atlantic" type has been fitted with a new type of safety-valve, invented by the works manager at Brighton, and not Ross "Pop" valves as stated in error by a correspondent recently. Large circular smokeboxes have been fitted to 0-6-2T's Nos. 479, 481, and 564. Nos. 54, 252, and 443 are, up to the present, the only L.B.S.C. section engines to bear the new design number plate. As a result of an interchange

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of boilers 2-6-0 "Moguls" Nos. 337 and 338 now carry double-domed boilers, while Nos. 352 and 353 have the original single-dome boilers. A S.E. & C. pattern safety-valve has been put on the boiler of 0-6-2T No. 496. Long cast-iron chimneys of the same type as used on the D1 class 0-4-2T's are now being fitted to the small I1 class 4-4-2T's as renewals become necessary. Among those already so fitted are Nos. 2, 4, 5, 7, 10, 602, and 604. No. 3 of the same class has a chimney of similar pattern to that originally fitted by Mr. Marsh when the class was first constructed. As boiler changes on these engines are frequent, it is probable that some of the above Nos. will reappear with old pattern chimneys and others with the newer style formerly carried by these. Engines now leave the Brighton shops with smokebox rivet heads showing outside in accordance with S.E. & C. practice instead of being cut off flush as previously done at Brighton. No. 192 is the last of the famous Stroudley 0-4-2 passenger engines running in the original form. She frequently works the 10.30 a.m. Sunday train from Victoria to Brighton.—[H. J. W. and R. D. NOLDREY.]

Certain engines on the L.S.W. section are having the steam heating pipes extended to the front end, and fixed screw couplings fitted to the leading drawbar hook. 4-2-2-0 engines Nos. 369 and 370 are frequently seen on passenger trains in the London area. Nos. 369, 370, and 373 have sand boxes to rear driving wheels.—[A. W. SMITH.]

The train used to convey H.R.H. the Prince of Wales from Victoria to Portsmouth recently was hauled by L.S.W. section 4-4-0 locomotive No. 429, and was composed of large L.S.W. main-line rolling-stock. Some of the new S.R. electric stock was noted being worked as a goods train over the L.B.S.C. section, near Clapham Junction, by an L.S.W. 0-6-0 engine, No. 700.—[G. RICHARD WINTER.]

The Nos. 759E to 762E have been allotted in the Southern Railway list to the four narrow-gauge tank locomotives formerly belonging to the Lynton and Barnstaple Railway.—["X."]

On the occasion of the King's journey to join the Royal Yacht in the Mediterranean the special train from Victoria was drawn by 4-4-0 E 165—one of Mr. Maunsell's re-builds; the vehicles were a Pullman, the South Eastern Royal Saloon, two more Pullmans, and a non-corridor brake van. The three Pullmans were drawn from the new white-painted vehicles in use on the Dover service.—[T. H. DONOHUE.]

Irish Railways.

In addition to those mentioned last month, the following further M.G.W. locomotives are employed on the D. & S.E.R.:—0-6-0T, No. 116 *Cong*, 0-6-0's Nos. 74 *Luna*, 130 *Ajax*, and 135 *Bittern*, 2-4-0 No. 34 *Aurora*, together with G.S. & W. 0-4-4T's Nos. 48, 73 and 80, 0-6-0's Nos. 118, 122, 145, 172 and 183, and 4-4-0's Nos. 5, 60, 63, 67 and 87.

At the time of the amalgamation, the D. & S.E.R. possessed only five named engines, these being 2-4-0T, No. 2 *Glenageary*, 0-6-0's Nos. 65 *Cork* and 66 *Dublin*, and 4-4-0's Nos. 67 *Rathmore* and 68 *Rathcoole*. The last four were built by Beyer Peacock of Manchester in 1905, and had brass name-plates, though all the other engines of this company had the names painted on. The M. & G.W. engines were all named with the exception of the "F" class 0-6-0 mixed traffic locomotives and a "Celtic" class 4-4-0 No. 124, formerly *Mercuria*, while large 4-4-0 No. 341 *Sir William Goulding* was the only G.S. & W. engine to bear a name.

D. & S.E. 0-6-0 goods locomotives Nos. 4, 50 and 51 have been rebuilt with Belpaire boilers.

M.G.W. 2-4-0 locomotives Nos. 13 *Rapid*, 14 *Racer*, 15 *Rover*, 16 *Rob Roy*, 21 *Swift*, 22 *Samson*, 24 *Sprite*, 27 *Clifden*, 31 *Alert*, and 34 *Aurora*, are now superheated, at the same time retaining their flat slide valves. 0-6-0 engine No. 53 *Duke*, built 1899 and rebuilt 1919 with the "Morton-Cusack" superheater, has gone to the shops to receive a new boiler and superheater of "Robinson" design. Old 0-6-0 locomotives Nos. 85 *Meath* and 135 *Arran Island* have been scrapped, together with several other damaged engines, and 0-6-0's formerly Nos. 95 *Bulldog* and 92 *Bittern*, respectively, now carry these numbers.

"MacDonnell" class 4-4-0 No. 62 of the G.S. & W. has been rebuilt with larger boiler and higher working pressure, Ross safety valves, extended smokebox and the new pattern large cab. She is equipped with a large tender of 3,300 gallons water capacity. Some of the big tenders removed from the 4-4-0 express engines are now running behind engines of the 0-6-0 type. [K. A. MURRAY.]

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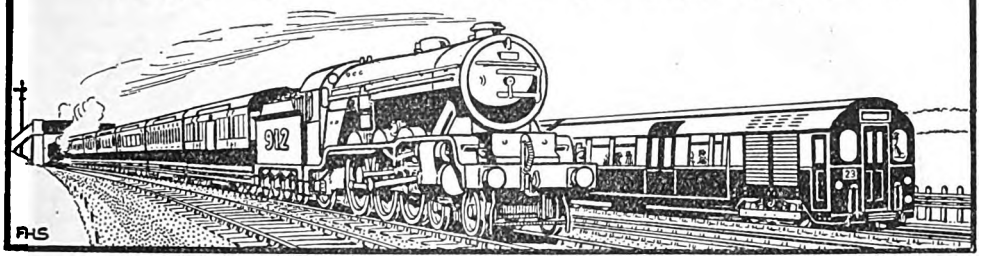
WHAT THE RAILWAYS ARE DOING.



Mr. W. E. Richardson has been appointed Secretary of the Irish Railway Clearing House, in succession to Mr. P. J. Brennan, who has retired owing to ill-health. Mr. Richardson entered Irish Railway Clearing House service in January, 1898, and for a considerable portion of his service has been connected with the Secretarial Department. He was Secretary of the Standing Committee of General Managers appointed in 1920–21 to deal with matters between the then Ministry of Transport and the Irish Railways as affecting railway workings, and has been Secretary of the Irish Railways Central Wages Board since its inception at the beginning of 1924.

* * *

It is with sincere regret that we record the death, on April 2, of Sir William Mitchell Acworth, K.C.S.I., at the age of 74 years. His writings on financial and economic aspects of railroading are generally considered to be the best of their kind, and it is admitted on all sides that his pamphlets and books rank as the leading text-books of the day. Sir William was brought most prominently before the public eye in connection with his work on Royal Commissions and other public bodies, and also by reason of the many excellent articles and books on railway matters that were published under his name. He did most important work (rightly recognised by His Majesty the King in the honour of knighthood granted to Sir William) as Chairman of the Committee appointed to inquire into the administration of Indian Railways. Subsequently he was engaged on an inquiry on behalf of the Austrian Government in regard to the re-organisation of the Austrian State Railways, and later was appointed as one of the Austrian State Railways, and later was appointed as one of the foreign members for the Board of Management of the German Railways Company constituted in accordance with the Dawes Report. Sir William Acworth was also closely connected with railways and tramways, particularly in London, as he was or had been a Director of the London Electric Railway Company, the Underground Electric Railways Company of London Limited and the Midland and South Western Junction Railway Company, besides having been Chairman of the London United Tramways Limited.

MR. W. E. RICHARDSON,

Appointed Secretary,
Irish Railway Clearing House.

* * *

We regret to record the death, on March 8, of Mr. James Asslin Campbell, Registrar of the London and North Eastern Railway Company. Prior to his appointment as Registrar of the L.N.E.R., Mr. Campbell held the office of Secretary to the late Great Central Railway Company, in which capacity he succeeded Mr. O. S. Holt at the end of 1917.

* * *

Mr. J. W. Manning, Hotel and Refreshment Rooms Manager of the Belfast and County Down Railway, having resigned, the directors have appointed Mr. W. C. Edge, of the Headland Hotel, Newquay, Cornwall, to fill the vacancy.

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Mr. R. W. TURIER,

Appointed Assistant Controller (Scotland), Hotel Department, L.M.S.R.

Mr. F. G. COOLING,

Appointed Assistant Controller, Dining Car Services in England and Scotland, Hotel Department, L.M.S.R.

Mr. S. W. BURLEIGH,

Appointed Assistant Controller, Southern Division, Hotel Department, L.M.S.R.

Photo.] [*N. S. Kay.*

Mr. G. O'B. HAMILTON,

Appointed Assistant Controller, Northern Division, Hotel Department, L.M.S.R.

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M. P. GHILAIN has been appointed General Secretary of the International Railway Congress Association in succession to the late M. J. Verdeyen.

* * *

M. FOULON, Administrateur, Belgian State Railways, has been elected President of the International Railway Congress Association in succession to M. Tondelier, who has retired after serving as President for a number of years.

* * *

THE following appointments have been made on the L.M.S.R. :—

Hotel Department.

Mr. S. W. Burleigh, to be Assistant Controller, Southern Division.

Mr. G. O'B. Hamilton, to be Assistant Controller, Northern Division.

Mr. R. W. Turier, to be Assistant Controller, Scotland.

Mr. F. G. Cooling, to be Assistant Controller, Dining Cars.

Mrs. A. M. Muggeridge, to be Controller's Assistant.

Shipping.

Captain Pritchard, Commander on the Greenore Service, to be Commander on the Mail Service.

Captain W. Ivor Roberts, North Wall Cargo Service, to be Captain, Greenore Passenger Service.

Mr. James O'Neill, Chief Officer, Mail Service, to be Captain, North Wall Cargo Service.

Mr. J. W. Huss, to be Chief Officer, Mail Service.

Chief General Superintendent's Department.

Mr. D. Simms becomes Chief Passenger Trains Clerk, Euston.

Mr. F. Wiles, of Saltley, becomes District Controller, Melton Mowbray.

Mr. G. A. Brown, of Derby, becomes Assistant District Controller, Saltley.

Mr. W. M. Ashall, of Manchester, becomes Passenger Agent, Bolton.

Mr. S. H. Fisher, District Traffic Superintendent, Crewe, becomes Operating Assistant, Crewe.

Mr. S. C. Humphreys, of Lancaster, becomes Assistant Divisional Controller, Crewe.

Mr. J. N. Phillipps, of Chester, becomes Assistant Divisional Controller, Crewe.

Mr. F. H. Fisher, of Chester, becomes Assistant District Controller, Rugby.

Mr. A. P. Hunter, of Manchester, becomes Assistant District Controller, Nuneaton.

Mr. G. S. Bellamy, Freight Trains Assistant, Derby, becomes Assistant Superintendent of Motive Power, Mid. Div., Derby.

Mr. D. W. Granet, of Derby, becomes Assistant Divisional Controller (Freight), Derby.

* * *

MR. R. W. TURIER, who has been appointed Assistant Controller (Scotland), Hotel Department, L.M.S.R., commenced his railway career in the offices of the London, Tilbury and Southend Railway Company at Trinity Square in 1903. In November, 1904, he joined the Midland Railway Hotels Department, serving at headquarters at St. Pancras under Mr. William Towle and his sons. In 1919 he was appointed Resident Manager of the Queen's Hotel, Leeds, under the direction of Mr. Arthur Towle, and in 1921 he was transferred to a similar position at the Midland Adelphi Hotel, Liverpool. He had held this office until taking up his present appointment, except that last summer he acted as Resident Manager for the opening of Gleneagles Hotel and carried this work on during the season. Mr. Turier comes from a railway family in that his father was connected with the Midland Railway Goods Department in London for many years.

* * *

MR. F. G. COOLING, who has been appointed Assistant Controller, Dining Car Services, Hotel Department, L.M.S.R., was born at Derby in 1880, in which town he entered Midland Railway service in the Midland Hotel Cellars and Stores Department in 1894 as a Junior Clerk. In June, 1895, he was transferred to the Chief Office of the Midland Hotels Department at St. Pancras, and eventually, after serving in various departments, became Chief Clerk to the Hotels Managers in 1901. In 1909 Mr. Cooling was promoted Assistant to the Hotels Managers, and in June, 1919, was made Superintendent of all Midland Refreshment Rooms and Dining Car Services. His present appointment dates from March 1 last.

* * *

MR. S. W. BURLEIGH, who has been appointed Assistant Controller, Southern Division, Hotel Department, L.M.S.R., entered the service of the London and North Western Railway Hotels Department in May, 1882, at the Euston Hotel. After filling various posts on the managerial staff of hotels and refreshment rooms at Euston, Birmingham and Rugby, he was appointed Manager of the Company's Hotel and Refreshment Rooms at Crewe in 1896. Mr. Burleigh was promoted in 1900 to the Management of the Queen's Hotel, Birmingham, and of several refreshments rooms in the Midland

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Mr. A. A. RYAN,

Appointed Hotels Manager,
Southern Scottish Area,
L.N.E.R.

Mr. G. N. PETERS,

Appointed Hotels Manager,
Northern Scottish Area,
L.N.E.R.

[*W. W. Winter.*

Mr. J. DALZIEL,

Appointed Assistant Electrical Engineer,
L.M.S.R.

Elliott] [*& Fry.*

Mr. R. F. MORKILL,

Appointed Superintendent of Signals
and Telegraphs,
Metropolitan Railway.

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District, and in 1915 to the Management of the Euston Hotel, and of all refreshment rooms in the London District. In 1917 Mr. Burleigh was promoted to be Superintendent of all hotels, refreshment rooms and dining cars on the London and North Western system. Consequent upon the amalgamation of the London and North Western and Lancashire and Yorkshire Railways in January, 1922, Mr. Burleigh became Divisional Hotels Manager (Division "A"), while under the L.M.S.R. he became Hotels Superintendent (Euston). Mr. Burleigh is a member of the Council of the Incorporated Association of Hotels and Restaurants, and serves on the Executive Committee of that body as elected representative of the English railway hotels. He was re-elected Chairman for 1923 of the Railway Hotels Conference for the fourth successive year.

* * *

MR. G. O'B. HAMILTON, who has been appointed Assistant Controller, Northern Division, Hotel Department, L.M.S.R., joined the Lancashire and Yorkshire Railway on April 14, 1898, previous to which he was for 5½ years with the Belfast and Northern Counties Railway, with headquarters at Portrush, and prior to that, three years with the Midland Railway under Sir William Towle. He then became Hotel and Refreshment Rooms Manager, Lancashire and Yorkshire Railway, with headquarters at Exchange Station Hotel, Liverpool. On the amalgamation of the London and North Western and Lancashire and Yorkshire Railways, Mr. Hamilton became Divisional Hotels Manager (Division "B"), and on the formation of the L.M.S.R. was appointed Hotels Manager, Northern Division.

* * *

RECENT changes affecting the Hotels Department of the Scottish Area of the L.N.E.R. have involved the following appointments, which date as from April 1:—

Mr. J. E. Ryan, Hotels Superintendent, Scotland, to be Hotels Superintendent, G.C. and G.N. Sections.

Mr. A. A. Ryan, Hotels Manager, Northern Scottish Area, to be Manager, Hotels Department, Southern Scottish Area.

Mr. G. N. Peters, Manager, North British Station Hotel, Glasgow, to be Manager, Hotels Department, Northern Scottish Area.

* * *

MR. A. A. RYAN, who has been appointed Hotels Manager, Southern Scottish Area, L.N.E.R., is a brother of Mr. J. E. Ryan, and has had over 20 years' experience in hotel management. He was born in London in 1884, being educated at St. Mark's College, Chelsea. Prior to entering the Hotels Department of the former London and North Western Railway Company in 1904, he served for three years with the Surveyors to the Ecclesiastical Commissioners for England. He was 10 years with the L. & N.W. Company, and was responsible for much of the work in connection with hotel reorganising, planning of structural alterations, furnishing, decorating and other improvements over the system. In 1914 he was appointed Hotels Manager of the Great North of Scotland Railway, Aberdeen. In the course of his career Mr. Ryan has also, with the permission of the railway companies, been engaged upon investigations and reports for outside companies and establishments. In 1918 Mr. Ryan held a commission in the R.N.V.R. and was engaged in minesweeping.

* * *

MR. GEORGE NAPIER PETERS, who has been appointed Manager, Hotels Department, Northern Scottish Area, is the son of Mr. John Peters, Manager of the Grosvenor Hotel, London. Although his railway service can be counted in months, he has had an extensive and varied experience of the hotel business. He received his early hotel training on the Continent, spending a period of four years in various establishments in Paris, Cannes, Beaulieu, Frankfurt, Cologne and Berlin, returning to London prior to the outbreak of war to take up a departmental appointment in the Ritz Hotel. During the war he saw active service as a captain in the R.F.A. He was appointed Assistant Manager of the Grand Hotel, London, in 1919, and Assistant in the Savoy Hotel in 1921. Prior to becoming Manager of the Company's Station Hotel, Glasgow—which position he vacates to go to the Palace Hotel, Aberdeen, where his headquarters will now be—he had the management of seaside hotels at Frinton-on-Sea and Cliftonville, Margate.

* * *

MR. J. DALZIEL, who has been appointed Assistant Electrical Engineer, L.M.S.R., completed his education at George Watson's College, Edinburgh. He then served an apprenticeship with Bertrams Limited, taking also a technical course at the Heriot Watt College, Edinburgh, obtaining its diploma in electrical engineering. Mr. Dalziel was also top honours man at the City and Guilds Institute, London, in 1899. He obtained further experience with Mavor & Coulson, Limited, with an electrical road-motor firm now defunct, and under Sir

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William Peck, of Edinburgh. In 1899 Mr. Dalziel entered Midland Railway service as an electrical inspector. In 1903 he was put in charge of electric construction and of the electrical shop at Derby, in 1905 taking charge also of the hydraulic and general drawing office. In 1914 he was made Chief Electrical Assistant to the Chief Mechanical Engineer in charge of electric power and lighting generally, and in 1916 took over also oversight of the Midland Company's petrol and electric road motors. With Mr. J. Sayers, Telegraph Superintendent, Mr. Dalziel accompanied Sir Guy Granet and Mr. F. Tatlow to America in 1913–14, to study American electric traction progress. Mr. Dalziel has also seen a good deal of German and Swiss electrification. In 1910, in conjunction with Mr. Sayers, he read a paper before the Institution of Civil Engineers on the Heysham–Morecambe electrification, in connection with which he had charge of the power plant and rolling-stock sections.

* * *

MR. R. FALSHAW MORKILL, who has been appointed Superintendent of Signals and Telegraphs, Metropolitan Railway, was born in Canada, and was trained as an electrical engineer in the shops of what became the Canadian General Electric Company. His first railway experience was as Superintendent of the St. John's, Newfoundland, Electric Light, Power and Tramway Company. At that time he was with the Canadian Mounted Rifles, and went out with them to assist in the Boer War, being mentioned in despatches. At the conclusion of those hostilities Mr. Morkill took a position on the Simmer & Jack gold mines in the Transvaal as electrical engineer, and in 1902 went to the Central South African Railway to organise the signalling, and whilst there held a commission in the Central South African Engineering Corps. When that railway was taken over in 1909 by the Railways and Docks Department of the South African Government he retired. Meanwhile he had been engaged in the operations for quelling the Zulu Rebellion of 1905–6. Going thence to America he joined the Union Switch Signal Company, and was associated with the chief engineer of that company in what is still one of the most important signalling installations in the world—the electro-pneumatic signalling of the Pennsylvania Terminal, New York. From there Mr. Morkill went to the General Railway Signal Company of Canada, first as business manager, and then as assistant general manager; leaving there to join the Grand Trunk Railway as Signal and Electrical Engineer. When the Great War broke out Mr. Morkill at once joined the Canadian Engineers and went with them to the Front in 1914, serving subsequently in France, Belgium, and with the Army of Occupation in Germany. He was, at the request of the War Office, transferred to the Royal Engineers, and commanded the 209th Field Company and, later, was removed to Transportation Branch, G.H.Q., to form and command the first of a new unit and the first of its kind—the 200th Railway Signal and Interlocking Company, R.E. He was awarded the Military Cross, and when demobilised held the rank of major. He then joined the French works of Tyer & Co., Ltd., of Dalston, as General Manager and Director, and subsequently became the Manager of the Carlisle works of the same firm, which position he was holding when he received his present appointment.

* * *

A SENTINEL-CAMMELL railway coach has been tested on sections of the L.M.S.R. in the Derby district, with a view to ascertaining its suitability for operating branch line services. The car is one adapted to carry 56 passengers, with luggage, although it weighs but 16 tons unloaded. It is 80 per cent. lighter than an ordinary branch line train, consisting of a locomotive and two carriages, and its coal consumption 75 per cent. less. Its first cost is much less than that of a tank locomotive and two carriages. The train can be driven from either end. The photograph reproduced on the opposite page was taken at Ripley station.

* * *

WITH reference to the article on "Recent Developments at King's Cross, L.N.E.R.," published in the March number, Mr. Hopwood points out that the present York Road station is not the original, but dates from 1878, when Maiden Lane tunnel was duplicated. Although G.N. trains had run to and from the Metropolitan since 1863, there was no (down) suburban platform for many years, and all trains ran into Maiden Lane tunnel and then set back into the local or main-line platforms. King's Cross suburban station was constructed and opened on February 1, 1878, and lasted until 1892, when widenings in connection with the opening of the third Maiden Lane tunnel caused it to be rebuilt somewhat farther west. The old wooden roof in the main-line station was replaced much earlier than stated, the up side span being renewed in 1870, and that on the down side in 1887.

* * *

THERE was a well-attended gathering at Neasden works of the Metropolitan Railway Company on March 14, the occasion being the annual competition for the Ambulance

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Challenge Shield, presented by the directors and officers of the company. Keen interest was shown by the four teams competing, the winning team gaining 353 marks out of a possible 500. The prizes were distributed by Mr. P. R. Boulton, Electrical Engineer, who was supported by several officers of the company. The examination awards and special certificates for first-aid rendered were distributed by Mr. G. Hally, Chief Mechanical Engineer, at a smoking concert held at the Remembrance Hall, Metropolitan Railway Athletic Association Grounds, on the previous Tuesday. Mr. W. M. Ballingall, Accountant of the company and Chairman of the ambulance centre, presided. Ninety-three awards were gained during the winter session, being an increase of 16 over the previous year.

* * *

COMMENCING April 1, the 6.5 p.m. L.N.E.R. Pullman car express from London (King's Cross) to Sheffield (Victoria) was scheduled to run via Retford instead of via Nottingham, and was extended to Manchester (Central). The arrival at Sheffield, which is therefore the first stop, is 9.2 p.m., a booking of 177 minutes for a distance of 161½ miles. Manchester (Central) is reached at 10.12 p.m. The corresponding up train leaves Manchester (Central) at 9.50 a.m., and Sheffield (Victoria) at 11.3 a.m., being due in King's Cross at 2 p.m.

* * *

COMMENCING April 1, Holyhead Pier station (L.M.S.R.) was closed as a passenger station, and passengers are now interchanged between train and steamer at Holyhead station. Numerous alterations have been made in regard to facilities in Scotland, particularly on the Highland section and on the coast services to and from Glasgow in conjunction with the Clyde steamers. Alterations and additions have also been made on various sections in England.

* * *

AT a meeting of the Railway Club on March 13, Mr. W. N. R. J. Back read a paper entitled "Early History of the G.N.R." The chair was occupied by the President, Mr. Cecil J. Allen.

* * *

KIRKBY and Pinxton station on the L.N.E.R. has been renamed Kirkby Bentinck, Brandon (Norfolk) station has been renamed Brandon, and Oakley station has been renamed Oakley (Fife).

* * *

AN interesting relic connected with the making of the Caledonian Railway was sold recently. It was a circular waiter, made of silver, and inscribed: "Presented to David Dickson, of Hartrie, by a few friends and neighbours, in gratitude for his unremitting exertions towards obtaining an Act of Parliament for making the Caledonian Railway, 1846."

* * *

"RAGS," the official collecting-dog at Euston, is causing considerable amusement by a trick which he appears to have learned from his many clients. Having noticed that railway passengers "beg" at the little booking windows till a clerk gives them a ticket, he tried it himself. The result was a biscuit. Since that time the dog has shown a declining interest in railway carriages, and prefers a round of visits to the various ticket offices on the station. His interest in booking-clerks, however, has not impaired his financial activities, and the dog's daily totals are well up to the average of those of his predecessor.

* * *

AT Woodhouse, five miles east of Sheffield, the existing up and down loops are being extended for a distance of nearly three-quarters of a mile through Woodhouse station to the west side of Woodhouse Junction, at which point the line to Grimsby and Lincoln leaves the main line to Nottingham and London. The work involves considerable excavation, the extension of bridges, and diversion of roads in addition to permanent way and signalling. This work will enable Grimsby and London traffic to be worked more or less independently of the Nottingham and London main line traffic. Between Woodburn Junction, one mile east of Sheffield and Darnall station on the main line to London, an up loop is being provided about one mile in length.

* * *

ARISING out of the circumstances that in the Palace of Engineering at the British Empire Exhibition last year there were exhibited the G.W.R. 4-6-0 locomotive *Caerphilly Castle* and the L.N.E.R. 4-6-2 locomotive *Flying Scotsman*, interesting locomotive trials were scheduled for April. It was arranged for a G.W.R. engine of the "Castle" class to be sent to the L.N.E.R., and for one of the latter railway's "Pacific" type to be exchanged for it. The engines were tested on the respective companies' expresses, comparative trials being carried out on each system simultaneously. The L.N.E.R. engine was allocated to the famous 10.30 a.m. "Cornish Riviera" express from Paddington. The trial engines had a week's preliminary running, starting on Monday, April 20, and the actual tests covered the week commencing April 27. Each engine was manned by a driver and fireman of its own company.

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MR. K. A. MURRAY mentions that several Great Southern and Western locomotives have had a narrow strip attached to their name-plates, bearing the letters G.S.R.

* * *

MR. T. H. DONOHUE points out that a set of London and South Western corridor vehicles is now being used for the "Sunny South" expresses between Eastbourne and Brighton and Liverpool, Manchester and Birmingham, alternately with a set of L.M.S. vehicles.

* * *

MR. A. WIGHAM, commenting upon Mr. H. W. Lea's remarks in the April number, points out that, whereas the old train used for the mail services between Kingstown Pier and Dublin weighed 107½ tons and carried 218 third-class and 50 first-class passengers, the train now employed weighs 125½ tons and carries 190 third-class and 64 first-class passengers. He points out, further, that some of the engines from other lines now used on the Dublin and South Eastern section are employed mainly on light and miscellaneous duties.

* * *

THE same reader explains that on the Dublin and South Eastern section of the Great Southern Railways of Ireland, Bray trains carry two lamps on the buffer beam and a "target" at the foot of the chimney; Dalkey trains have one lamp over the left buffer beam and a diamond at the foot of the chimney; Kingstown trains have one light over the left buffer beam and one at foot of chimney, while trains to the Mail Pier carry Bray headlights, except that the light is green, over the right buffer beam. The "target" or diamond is not indicated at night.

* * *

MR. G. T. BLUNT mentions that several old coaches, which apparently belonged at one time to the Bideford, Westward Ho! and Appledore Railway, can be seen utilised for dwelling purposes at Wellingborough, near the L.N.W.R. station.

* * *

MR. K. A. MURRAY remarks that the locomotives which were exchanged some years ago between the Great Northern and Great Southern and Western Railways of Ireland were Great Northern No. 113, *Neptune*, and Great Southern and Western No. 321.

* * *

MR. H. BYGRAVE informs us that London and North Eastern coaching vehicles are in future to be denoted in classes by the following prefix numerals: 1, East Coast Joint Stock; 2, North Eastern; 3, Southern Scottish; 4, Great Northern; 5, Great Central; 6, Great Eastern; 7, Northern Scottish. The system is explained by the following example: Great Northern 198N will be 4 198, and so on. Mr. Bygrave also mentions that the stop by Leeds expresses at Holbeck is no longer compulsory, though speed has to be reduced to 2 m.p.h.

* * *

MR. O. J. E. ANDREWS points out that in the reference to a fast run on the G.W.R. mentioned on page 247 of the March number, the engine should have been stated as "Carmarthen Castle," not "Carnarvon Castle." He also mentions that the scheduled time of the train in question is 105 minutes for the 106·7 miles to Bath, and not 106, as stated.

* * *

SUGGESTED by a paragraph recently published, the Rev. E. T. Geoghegan, writing from Bath, points out the wide variety of routes by which tickets are issued at the same fare between Cambridge and Bath. The fare is based on the shortest route *via* Bletchley and Oxford, but passengers can also travel *via* Liverpool Street or King's Cross and Paddington, *via* Bletchley and Birmingham, *via* Kettering, Leicester and Birmingham, or *via* Ely, Peterborough, Rugby and Birmingham. He also points out that it is sometimes preferable to pay a few shillings additional to reach a station served by principal expresses rather than to travel by a normal route if it involves a more or less lengthy branch line journey to a station at which secondary expresses only stop in the ordinary way. He quotes, as an instance, journeys from Whitehaven, in Cumberland, to the South Coast, and the desirability of travelling first to Carlisle instead of travelling *via* Carnforth. This course also enables one to utilise through carriage facilities and connections not otherwise available, which alone may justify the additional expense.

* * *

MR. G. W. BISHOP, of 57, Warwick Road, Kenilworth, Warwickshire, English Representative of the Railway and Locomotive Historical Society, asks for information as to the International Association of Railway Correspondents.

* * *

IN view of comments by various readers upon Mr. Hopwood's article in the March number on the 0-4-2 locomotives of the late London and South Western Railway, Mr. Hopwood confirms the statement made by one reader that No. 555 was used on the occasion of Queen Victoria's funeral; also

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that the Westinghouse-fitted engines had the air container placed below the footplate, outside the frames and between the driving and trailing wheels. No alteration was, however, made to the trailing wheels, which had outside bearings as usual.

* * *

THE Madagascar State Railways (metre gauge) have ordered two "Garratt" locomotives of 25,000 lb. tractive effort. These will be built under licence from Beyer, Peacock & Co. Ltd. by the Société Anonyme de Saint Leonard, Liège (Belgium).

* * *

WEEKLY season tickets have been introduced on the "Bakerloo" between Queen's Park, Kilburn Park, Maida Vale and Warwick Avenue stations, and other stations. The tickets are issued on demand at the booking offices. The new "seasons" are of a new and distinctive type, the date of availability being shown in large figures.

* * *

STATION and signal cabin automatic indicators are to be installed on the "Hampstead" and "City" lines. The system will be similar to that in use on the District Railway for many years past, although of simpler design.

* * *

WITHIN an area bounded by Hendon (Central), Highgate and Finsbury Park on the north, Clapham Common on the south, Liverpool Street and Mansion House on the east, and Hammersmith on the west, 6d. is now the maximum fare for any journey within these limits, continuous or composite, throughout the system of railways operated by the "Underground" railway companies.

* * *

AN extensive scheme of tours has been planned by the L.G.O.C. for their motor coach season which commences on May 25. The principal tours which will be run are :—Oxford (an entirely new tour, covering a distance of 120 miles); the river, Windsor, Stoke Poges and Hampton Court; Hindhead and Leith Hill; Penshurst and Tunbridge Wells; and "Seeing London." There will also be half-day tours to Guildford and Newlands Corner, Windsor and Eton, and Westerham and Sevenoaks. In addition, the company will operate afternoon and evening tours from Golders Green, Shepherd's Bush, Peckham and other suburban centres. In 1924, 778 tours were run by the coaches, covering a matter of 43,500 miles. An increase of 17 per cent. was also recorded in the number of passengers carried.

STATIONS at Cheltenham and Keynsham have now been renamed as follows: Cheltenham Spa (St. James); Cheltenham Spa (Malvern Road); Cheltenham Spa (Lansdown), L.M.S.; Keynsham and Somerdale.

* * *

ON the occasion of the British railway centenary celebrations, a number of Florentine railwaymen have, it is reported, offered to present their British colleagues with a bronze plaque in memory of George Stephenson. The gift will be presented at the forthcoming International Railway Congress in London by a special committee headed by the Minister for Communications, in the name of Italian railwaymen.

* * *

SEVEN-DAY third-class season tickets (Sunday to Saturday inclusive) have been introduced by the Metropolitan Railway between certain stations. Examples of the new rates between Baker Street and the following stations are :—Swiss Cottage, 2s.; Finchley Road, 2s. 3d.; West Hampstead, 2s. 6d.; Kilburn, 2s. 9d.; Willesden Green, 4s.; Dollis Hill, 4s. 6d.; and Notting Hill Gate, 2s. 6d. Similar tickets are issued on other sections. The seven-day season tickets are obtainable on demand at the booking offices, the usual form of application being dispensed with.

* * *

THE Wimbledon and District Model Railway Club have arranged the following events for this month. May 4: Lecture by Mr. H. H. Hudson on "Cardboard and Model Railways." May 18: A Test-Track Evening; and May 23, a visit to Old Oak Common Locomotive Depôt, G.W.R. (Members should meet at Willesden station, L.M.S., at 2.45 p.m.). The visit, on February 28, to Battersea Locomotive Depôt proved of great interest, a thorough inspection of the round-houses and surroundings being made. The Hon. Secretary, R. Shephard, 27, Bernard Gardens, Wimbledon, will be pleased to give all particulars to prospective members.

* * *

THE s.s. *Corland* commenced working at the L.N.E.R. staiths at West Dunston, at 7 a.m. on March 27, and by 2 p.m. had taken on board 4,600 tons of coal. Between these times teeming was suspended for practically two hours to enable the vessel to be moved in connection with the process of loading. Between 11.55 a.m. and 12.25 p.m. the equivalent of 68 10½-ton wagons were shipped, this being at the rate of 1,360 tons per hour. This latter figure constitutes a record for the Tyne.

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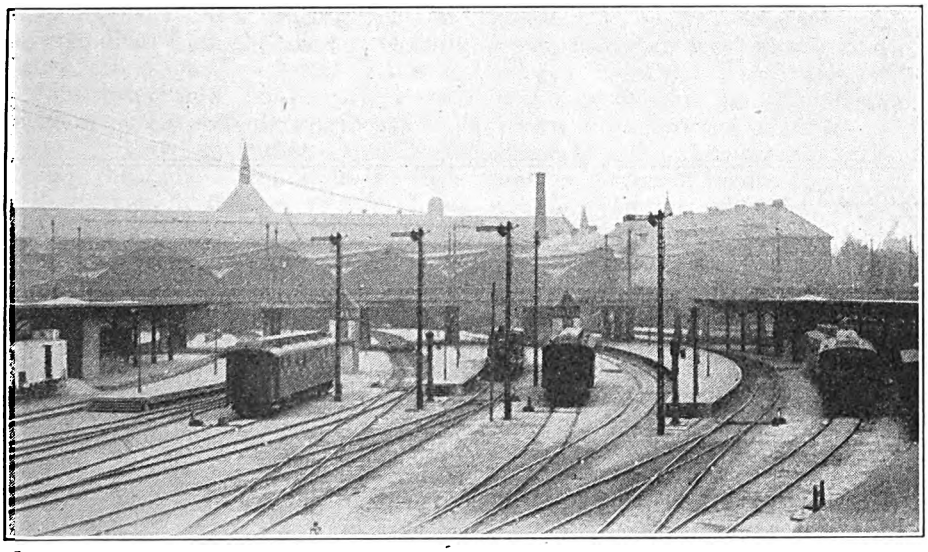

CHIEF STATION, COPENHAGEN, FROM THE SOUTH.

The State Railways of Denmark.

By EDWIN J. MILLER.

(*Photographs by the Author.*)

IT was not till nearly 18 years after the Liverpool and Manchester Railway had been opened, and over 1,200 miles of railway had been opened in Europe, that Denmark had its first railway. Several reasons combined to cause this tardy construction. The country was, and is, to a very great extent agricultural, while the physical characteristics of the kingdom, which comprises the Jutland and four main islands, make it an important maritime country. The deeply indented fiords or bays enable seaborne traffic to reach nearly all important towns. In June, 1847, a private company, the Zealand Railway, opened the line from Copenhagen to Roskilde (19 miles), but the great hopes of this line did not materialise; the dividends (when paid) never exceeded 2¼ per cent. In 1856 the line was extended to Korsör, on the Great Belt, and the State gave a guarantee of 4 per cent. on the capital employed.

Up to this date little or no interest was taken by the Danish people in railway affairs, but a change now took place, and a line was constructed in 1864 to Elsinore (Helsingör) via Hillerod. Between 1861 and 1867 three English engineers constructed for the account of the State some 300 miles of railways in Jutland and Funen, but the results of operation were so poor that the State bought the lines from the working company, and these formed the nucleus of the State Railway network. The development of traffic led to the opening of two important lines in Zealand and Falster, viz., Roskilde–Kalundborg and Roskilde–Mäsnedsund (Zealand), Orehoved-Gjedser (Falster), conceded to the Zealand Company. These new lines did not yield the financial results obtained from other sections of the company's lines, and led in turn to the refusal of the Zealand Company to co-operate in establishing a ferry service across the Great Belt, and thus link up Copenhagen with Jutland, the train ferry across the Little Belt (Strib-Fredericia) having been opened in 1872. For various reasons the State decided to purchase the lines, and the Zealand system, with its 330 miles of railway, was acquired by the

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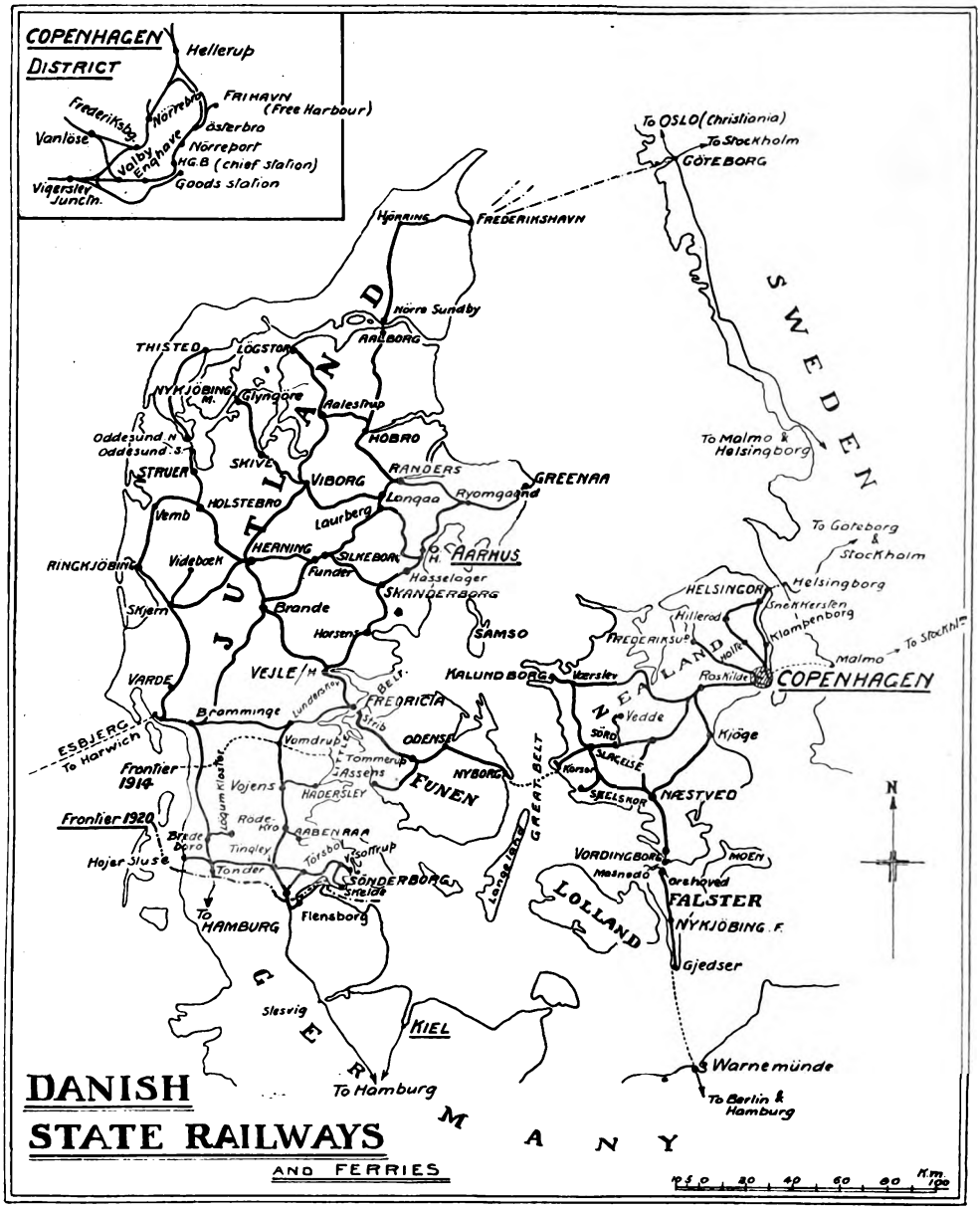

MAP SHOWING DANISH RAILWAY SYSTEM.

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State in 1880 at a cost of nearly £3,000,000. Numerous lines from this date were built by the State to act as feeder routes to the main system now formed. The development of purely secondary railways was left to private enterprise, the State reserving the right to purchase the lines at a date generally fixed at 25 years from the opening.

This right of pre-emption was exercised in 1914 for certain lines in Jutland, but the majority of the local lines continue to operate, the State not having exercised its right to purchase. From 1880 onwards the State Railways continued to develop the system of ferry boats across the various maritime connections, completing those between Gjedser in Denmark and Warnemünde in Germany in 1903.

On March 31, 1923, the Danish State Railways had a mileage of 1,497, of which 211 miles were double track, and eight ferry routes of 73 miles. The private railways operated 1,567 miles of track at that date. Denmark, though relatively late in developing its railway network, has now a greater mileage proportionate to population than any country in Europe, Sweden excepted.

In 1919, as a result of the plebiscite, Denmark regained from Germany the province now called South Jutland, and with it 155 miles of railway, and the proportionate quota of rolling-stock to work the same. The evidence of German occupation, which dated from 1864, such as signalling, has been entirely removed, and the Danish system installed.

The permanent way on the main routes is composed of rails weighing 91 or 82 lb. per yard. On the secondary routes the weights are 75 or 65 lb. respectively. The rails are bolted to wooden sleepers. In Jutland particularly the rail ends are supported by two sleepers placed to touch each other, and secured by narrow short fishplates. The ballast varies from sand to heavy stone, and in places some granite. The sand ballast is being replaced in many parts by stone. In Zealand the practice of laying the rail ends over two adjoining sleepers is only noticeable to a small extent, but here the sand ballast is apt to create a certain amount of dust during the passage of trains. In Jutland, where a considerable amount of double-tracking is in progress, a second track frequently runs at a different gradient and level, following more closely the contour of the country. There are more level crossings existing in Zealand than elsewhere, owing to the incidence of private property adjoining, but in Jutland very few remain, most roads being taken under the line. In this connection ferro-concrete plays a very important part, considerable engineering works being carried out in this material throughout Scandinavia. The physical contour of the country has avoided the necessity of making any tunnels, which do not exist except the one in Copenhagen, which is built on the "cut and cover" system. A few bridges of importance span the various fiords, of which the one at Aalborg, over the Limfjord, may be cited, with five fixed spans and one movable. This is constructed of steel lattice girder type. The newer examples are constructed in ferro-concrete, of which the illustration of the Susaa Bridge on p. 429 is representative.

The gradients on the main routes nowhere exceed 1 in 100, and these occur chiefly in Zealand on the line Copenhagen-Hillerod, and in Jutland on the 6 miles stretch between Aarhus and Hasselager. On this latter route the only banking engine in Denmark appears to work. Many of the routes for miles have no gradient steeper than 1 in 140 to 1 in 200, or even less. On two relatively unimportant lines in Jutland, gradients are found as steep as 1 in 70 and 1 in 80. The gradients are figured as in English practice—to an approaching train the posts appear at right angles to the track, the incline to be negotiated being shown on the right-hand arm, the other for the incline already traversed being left blank. These posts, together with speed restriction and distances, are painted in red lettering on white ground.

The signalling follows Continental practice and signals are of the all-metal type and comprise home, starting and distant. The same type of signal is not employed for the same use everywhere. The home signals are usually on very tall posts and have a circular end to the arm. The distant signal is frequently placed below the home, and at wayside stations, so as to repeat the starting signal.

The arm of the distant signal has a fish-tail end. It is painted red and is passed

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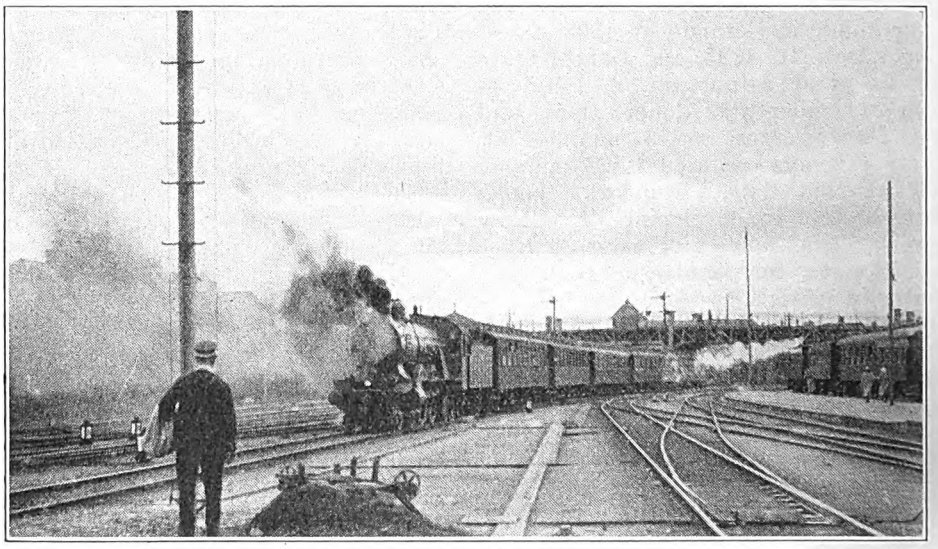
at danger. At night the danger position is shown by flashlight in equal periods of red light and dark. The writer did not observe distant signals in Jutland, North of Randers, possibly, in view of the lighter traffic handled in that region. The distant signals are indicated by a series of three posts placed approximately 3,000 ft., 2,100 ft., and 1,200 ft. from the signal, the first post has one white board with red outline mounted at an angle of 45 degrees in the lower quadrant, the second post two, and the third post three, similarly arranged. At a few junctions, signals are mounted one below the other on the same post to indicate diverging routes, and an occasional bracket type of signal with "dolls" is seen, giving similar indications. In Zealand, with its heavier traffic, two special types of signals have been installed. In the Copenhagen area, on the coast line, outer distant signals with diamond-shaped end of arm painted white with a flash of shorter duration are in operation, while at Vigerslev Junction the signals for that place are repeated by three "light" signals with alternate flash green and red, placed in front of a black painted board. Interlocking of signals and points occurs only on the main routes, elsewhere the signals are generally worked from boxes and the points by hand switches at the actual junction. It may be mentioned that trains keep to the right on double-track sections. At most stations of importance the accommodation appears to be adequate, but many stations are being rebuilt in the pleasing style of red brick and stone facing architecture peculiar to Scandinavia. Many of them have now passenger subways, a large number of which are under construction. With few exceptions, train departures and arrivals are fixed at regular platforms, and each station, however small, has a painted board indicating this together with the time and number of train. Indication is also given of the character of the train and the stops made. Exception to this is made in the Copenhagen area, with its heavy traffic, where these indications are shown on grooved boards with movable metallic letters, which affords facilities for the constant changes.



TRAIN AT NYBORG HAULED BY CLASS "P" ENGINE.

It would not be possible to describe in this article the 27 types of locomotives, numbering 692 machines, but the following types may be noted: R class, 4-6-0, with driving wheels, 6 ft. 1½ in. and two simple outside cylinders 22½ in. in diameter, also the same type with three cylinders of 18½ in. in diameter. These engines work the express services in Funen and in Jutland, South of Randers.

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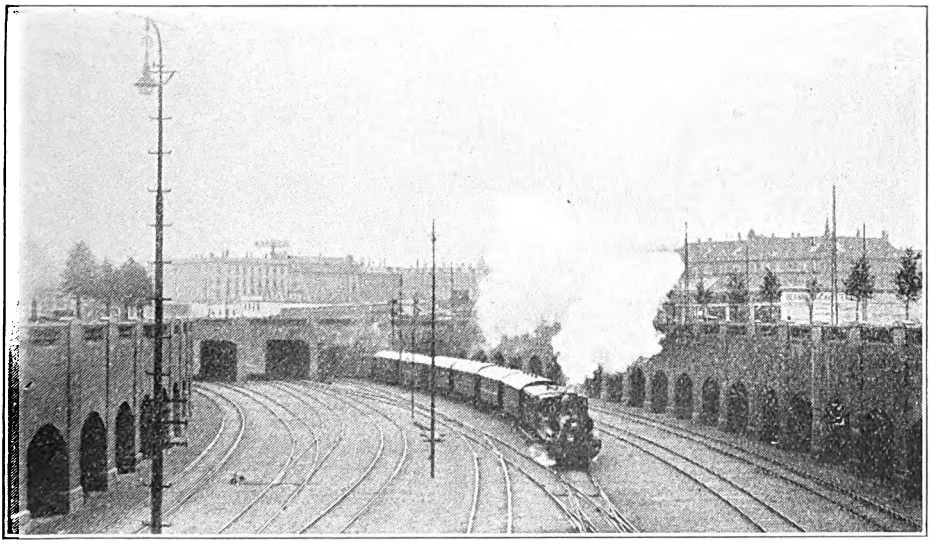
P class, 2-4-2, with coupled wheels 6 ft. 6¼ in., and two high-pressure cylinders 13⅝ in. in diameter and two low-pressure cylinders 22½ in. in diameter. These engines work express services in Zealand, Funen, and also between Fredericia and Esbjerg. These two types have 8-wheeled tenders.

K class, 4-4-0, with driving wheels 6 ft. ¾ in., and two cylinders 17 in. diameter. These are used on the Elsinore routes in Zealand, and in Jutland particularly North of Randers, and on the secondary routes.

The principal tank engines are type O, 2-4-2, with driving wheels 5 ft. 7¼ in., and outside cylinders, 17 in., and are chiefly employed in the suburban area around Copenhagen.

F class, 0-6-0, wheels 4 ft. 1¼ in., with cylinders 16 in. diameter. These are used for shunting purposes throughout Denmark, and in certain local services. The two chief goods types are D class, 2-6-0 tender engines and G class, 0-6-0, with four-wheeled tenders. These are seen in all parts of the kingdom. The passenger rolling-stock shows a wide variety of design, from double-deckers and semi-open vehicles to the quite luxurious corridor cars. The best cars running are the A.S. type, having six compartments, each accommodating six second-class passengers. These are convertible at night into sleeping cars, reducing accommodation then to four per compartment. The cars are exteriorly painted light red, except certain local stock of match-boarding design, finished dark brown. Both the corridor and compartments are very roomy. The corridors are amply fitted with coat hooks and luggage racks and drinking water is always available here. The compartments are entered through two sliding doors, and seat six passengers. They are upholstered in brown leather and buff moquet, with four loose cushions of similar style at the central gangways. Each compartment is embellished with four photographs, views of local resorts, and all notices are exhibited under glass in Danish, English, and German. Each car is electrically lighted, and has two lavatories, and a seat for the guard. These remarks refer to second-class vehicles, first-class being non-existent except in international services. The third-class cars are not upholstered and interiors are painted pale green. These have similar lavatory accommodation, but no special appointments.



COPENHAGEN.—TRAIN LEAVING VIA BOULEVARDBANE.

The local services round Copenhagen are worked for the most part by stock with centre gangways and tramway ends, in

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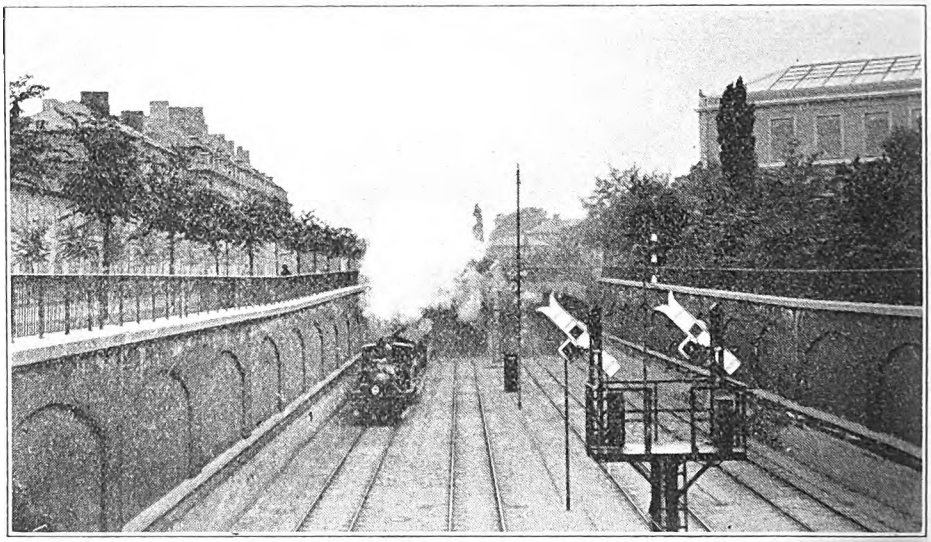
some of which the seats are reversible. Many have quite good toilet accommodation, though of restricted size. A number of double deckers and semi-open cars are introduced into the services during times of pressure and very fine weather. These vehicles are all of the four-wheeled type and cannot be described as the "acme of comfort." The illustration on page 430 depicts some of these cars. Much of the local stock of compartment type resembles English in appearance, but toilet accommodation is available in every train. Generally speaking, the local carriage stock in Zealand appears less up to date than in other parts of Denmark, but is quite suitable for the dense traffic conveyed. Nearly all services, other than local, appear to be worked with bogie stock, the riding of which is quite steady. The weights of the through and international trains are often considerable, the morning and evening Jutland services from Copenhagen averaging 350 tons net. The weights of the local services average on weekdays about 150 tons, and when strengthened on Sundays and holidays run up to 200 tons.

The fares on the State Railways—though much above the pre-war scale—are still reasonable. The fares for 1 mile are in second-class 1·3d., and third-class 0·75d. The same ratio is in force until the journey exceeds 140 miles, when the charges per mile gradually lower; for instance, a journey of 400 miles would cost second class £1 and third class 12s. Sleeping-car second-class tickets are also relatively cheap: the second-class fares from Copenhagen for an entire trip, 10s., and in the new third-class service recently introduced, 6s. 8d. It should be said that these prices are worked out on the basis of 26 kroner to the £1. The ordinary first-class fares are obtained by adding the second- and third-class figures. A supplementary tax is levied for use of express trains, irrespective of distance, of 1s. 6d. and 10d. for the respective classes. Season tickets, based on distance or inter-station, also between all stations, are issued for varying periods up to twelve months. As an instance, a third-class ticket available between all stations for 14 days costs about £1 18s. A very limited number of excursions are run on Sundays only and by special trains. These are third class, and the fares are double journey for single fare.



OSTERBRO. TWO TRAINS EMERGING FROM BOULEVARDBANE TUNNEL.

Note distant signals for station.

It may be of interest, at this stage, to review the varied characteristics of the three divisions into which the State

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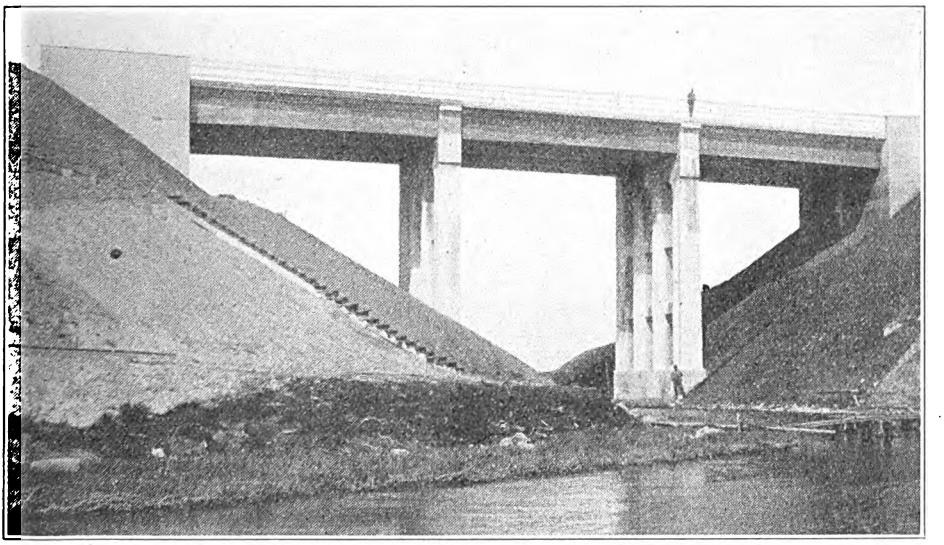
Railways are divided. Starting from the west, the Third Division, with its 620 miles of track, occupies all the Jutland peninsula west of the main line from Padborg to Frederikshavn, with the exception of the line from Lunderkov to Esbjerg. This Division, with its headquarters at Struer, traverses the most desolate part of Jutland, which here is almost treeless, being mostly comprised of moors and heathland. The chief sources of revenue to the railway are from the products of agriculture. In consequence of this, the train services are meagre and average only 10 trains per day throughout the area. There are no express services proper, though incidentally this Division furnishes the fastest short distance run in Denmark, between Vemb and Ringkjöbing a speed of 41·6 m.p.h. being booked. Though no important maritime centres are served, two train ferries on inland waterways are operated: viz., Oddesund South to Oddesund North and Glyngöre to Nykjöbing M., each $1\frac{3}{4}$ miles. In connection with the latter it is not without interest that at Nykjöbing the railway consists only of a few sidings, the principal purpose of the one engine stationed here being to marshal the goods vehicles, and to place them on or take them off the train ferry.

The Second Division has a mileage of 500 and presents a striking contrast. As mentioned, it includes the main line down the west coast of Jutland and all branches west thereof, also the lines on the Island of Funen. The deeply indented west coast provides numerous harbours for the Danish maritime industry, and the countryside itself is reminiscent of England. The towns on this coast furnish a good deal of traffic to the railway, Aarhus, the seat of management, being the second largest town of the kingdom. The chief traffic centres on this Division are Aalborg, in the station of which four private railways make connection with the State lines. Aalborg is situated on the south shore of the Limfjord, the traffic across which, prior to the opening of the present swing bridge, was worked by a train ferry. Aarhus is second only to Esbjerg in volume of traffic dealt with. The rearrangement of the goods yard and new passenger station is in progress, the cost of which will be about half a million pounds. The present accommodation consists only of temporary wooden buildings and three platforms. Two large bridges in ferro-concrete span the extensive accommodation now being made here.

Esbjerg is probably well known to readers of the RAILWAY MAGAZINE as the



SUSAA BRIDGE, NEAR RINGSTED.

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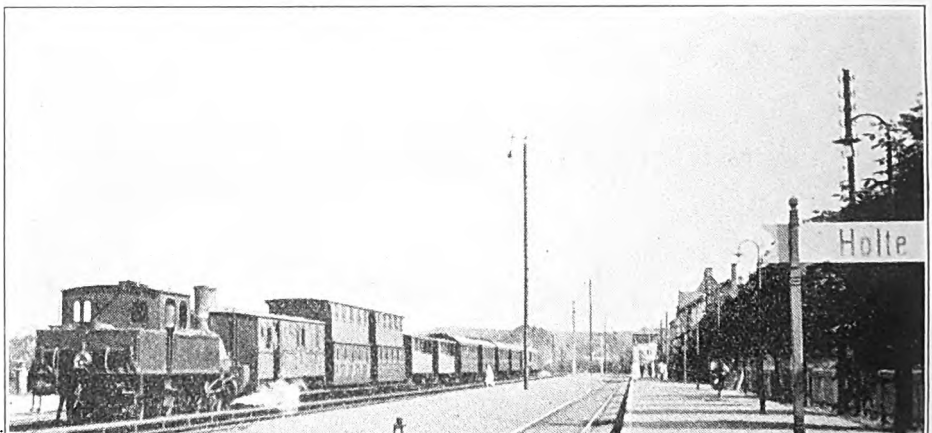
port of export of the many Danish agricultural products to this country. The mail service to England sails from here, the traffic therefor being dealt with at the harbour station, immediately adjacent to the steamship berths.

Fredericia is the most important "junction" station on this division, perhaps in all Denmark. In effect, five main routes centre here, and the local traffic dealt with is far exceeded by that dealt with *en route*. The station presents the most animated appearance between noon and 3 p.m., when it handles the principal express daylight services in Jutland, as well as those to and from Copenhagen. The three platforms here seem almost inadequate to cope with the amount of traffic at these times. If trains are running late, congestion is hardly possible to be avoided—a circumstance which came to the writer's knowledge during his first trip. From Fredericia to Strib the Little Belt is crossed by single-track train ferries of "screw" type, the distance between these places being about one and a quarter miles. It has been decided to bridge the Little Belt near the ferry route, at a point where a bridge and the approaches would not exceed two miles. The Bill is already law, but conflicting proposals as to whether the bridge should be for a railway only or include a road also have prevented the scheme reaching an advanced stage. From Strib the State Railway has a double-track line through Funen to Nyborg on the Great Belt. Odense, the capital of the island, is situated about half-way. This station is the largest in Denmark outside the Copenhagen terminal, having eight platforms; it is served by five private railways also, and a considerable exchange of traffic is made here. The Great Belt to Korsör, 16 miles, is traversed by the train ferries of this division. These are double-track, screw steamers of modern design. The two tracks have a clearance length of 235 ft., and between the buffer-stops the distance is 280 ft. in the largest type of ferry used. These vessels ordinarily take about five passenger or 12 goods vehicles per trip. The journey across occupies about 80 minutes. At Korsör are stationed the ice-breaking steamers. No serious delays have occurred since the winter of 1921–22, when the Great Belt was partially closed by ice for over a month, necessitating the constant use of these ice-breakers. From Nyborg to Kiel a joint service with the German State Railways was run until the outbreak of war. The German steamers continued to run at irregular intervals till the end of 1923. Incidentally, this was the quickest



HOLTE STATION, AND A TYPICAL SUBURBAN TRAIN HAULED BY "O" CLASS ENGINE.

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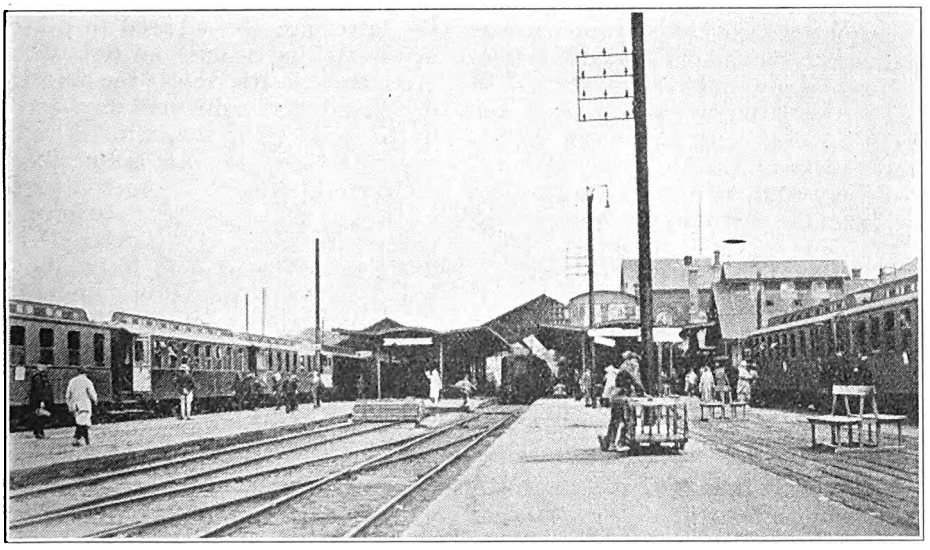
communication from Copenhagen to Paris, and has been supplanted by a weekly service from Esbjerg to Dunkirk. The fastest express train runs on this division compared with pre-war are :—

	Miles.	Best Train Speed. m.p.h.
Funen :—		
1914 (6 runs) Odense-Strib	.. 33·6	42·07
1924 (5 runs) ,,	.. 33·6	38·83
Jutland :—		
1914 (1 run) Lunderskov–Esbjerg	34·6	40·21
1924 (1 run) ,,	34·6	36·39
1924 (1 run) Randers–Aarhus H.	36·3	38·24

1914. This run was not made.

The First Division, with 382 route-miles, is the smallest but is, however, the most important section of the State Railways; it comprises the lines in Zealand and Falster which are linked together by a train ferry. Zealand is the most densely populated unit of the kingdom, and, moreover, includes Copenhagen, the capital, with its two-thirds of a million inhabitants. Copenhagen is both headquarters of the railway and of this division. The traffic on this section is the heaviest, as, apart from the large and travelling population, the "goods" service is enhanced by the presence in Copenhagen of a number of manufacturing plants. The most important centres outside Copenhagen are Roskilde, Helsingör, and Klampenborg. The first mentioned is an important junction 19½ miles from Copenhagen, where three routes diverge. Helsingör is the terminus of the "Nordbane" line via Hillerod, and the "Kystbane" (coast line) via Klampenborg. It is also the point from which the train ferry operates to the Swedish town of Halsingborg, across the Sound, here only three miles wide. The station, though built less than thirty years ago, has four platforms, but does not seem at all adequate for the heavy traffic dealt with, especially on Sundays. Klampenborg is the terminus of the inner suburban traffic on the Kystbane and has four platforms, two of which are terminal lines. The number of passengers dealt with here is very large throughout the summer, notably on Sundays. Besides the usual facilities for booking tickets, a number of kiosks for that purpose have been erected in the vicinity. The inward traffic is controlled by a series of barriers, similar to that employed by the London tramway system. This station, together with five others on the coast line, have each two centre tracks for trains not stopping.



FREDERICIA STATION.

An important new railway was opened in June, 1924, from Ringsted to Naestved. This is double-tracked and has several

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engineering works, the most important of which is the Susaa Bridge. The international traffic to Germany, hitherto run via Kjöge, has now been diverted to this line.

The Hovedbanegaard (chief passenger station) is the finest in Scandinavia and deserves an extended description. The final works in connection with it were completed in 1921, having covered a period of 17 years. The first operation was the construction of new goods yards, sheds, and workshops on a site near the harbour. The then chief passenger station was demolished in 1911, at which date the present station was opened for west and south traffic. The traffic for the north continued to be dealt with at four terminal stations, one at Osterbro and three others in the vicinity of the old Zealand station, *viz.*, Nord, Holte and Klampenborg. In 1917 the two latter were abandoned, the traffic being dealt with at the new station *via* two tracks of the "Boulevardbane." In October, 1921, two more tracks were added, and the Nord station was closed, and the sites of these stations are now being developed as part of the town.

The chief passenger station is situated just south of the important thoroughfare Vesterbrogade and between the two parallel streets Bernstorffgade and Reventlowsgade. Entering the station from the Vesterbrogade, the vestibule is gained, in which are situated the chief booking offices. Beyond is entered the great hall (452 ft. 9 in. by 183 ft. 9 in.). This is roughly divided lengthwise into three sections, *viz.*, outward circulating area, luggage department, and inward circulating area. On either side of the vestibule are the various waiting rooms, in the 3rd class of which are supplementary booking offices, restaurant and kiosks for the sale of passengers' requirements. A post office and customs house are also situated here. The six platforms, which lie at right angles to the station building and about 20 ft. lower, are each approached by a set of stairways, similar stairways being provided on the inward side for arriving passengers. Entrances and exits are also provided for both the parallel streets mentioned, the inward circulating area also gives access to the station offices, barber's shop, baths, &c. The luggage department is connected by lifts to the service platforms below, and grouped around it are kiosks let to the various tourist and sleeping-car agencies. Fronting Bernstorffgade, where is the principal exit, is the suite of royal waiting rooms, three at street level and three below, the latter connecting with a service platform. The roof of the station building is of wood, in two spans, and where not light-varnished has been painted dark red. Both by day, and by night, when lighted by twelve immense chandeliers, the effect is bright and attractive. At this station, also certain others in Zealand, tickets are examined before reaching the trains, but elsewhere in Denmark stations are "open." The arrivals and departures of trains and platforms served are advised by posters, the latter are also advised to passengers in the waiting rooms and restaurants by glass and electric signs, the information being conveyed in different ways according to the character of the train. The twelve tracks in the station are arranged so that each one is situated between a passenger platform and a service platform. The former are raised to "standard" height, while the latter are only 10 in. above rail level. On these platforms are built the columns supporting the roof of six spans, leaving the passenger platforms entirely free from any obstruction. A subway connects each passenger platform, and above the respective staircases an inspection kiosk is situated from which the assistant stationmaster on duty in conjunction with the chief signal-box (No. 3) regulates the arrival and departure of trains. Similar information is also conveyed from this box to the ticket examiners in the circulating area. Eight signal-boxes are required to control the passenger traffic. The tracks through the station and yards are arranged with a view to a future development of "through running," but in ordinary practice the station is operated as a terminal. A railway post-office is located just south of the station, and communicates with each of the service platforms by means of passageways and lifts. It has also some special tracks at which large consignments of postal matter can be loaded. The cars are then taken by a shunting engine to their respective trains. The passenger train sidings and the goods station are situated a little west, the latter having separate running lines to

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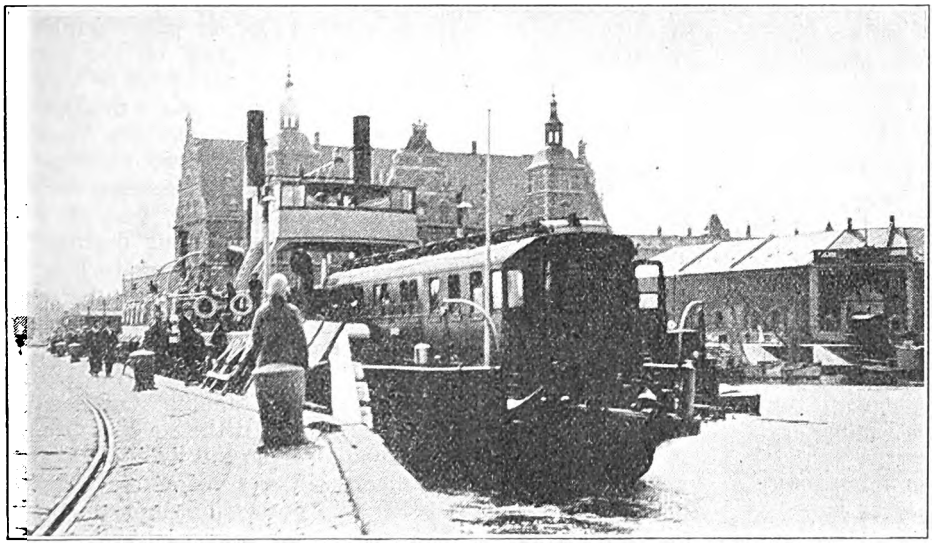
Vigerslev Junction and to Osterbro. The running sheds are connected with the passenger station by two flying junctions, one for fast and the other for slow traffic. The sheds have accommodation for 96 locomotives and the coaling stage for which is connected directly to the harbour by an aerial ropeway with a capacity of 600 tons per day. North of the passenger station four tracks run to Hellerup (4¾ miles), and the line as far as Osterbro, being partly in tunnel, is known as the "Boulevardbane."

In this section is the station Nörreport, the station buildings of which are below street level. The central station and

A large residental traffic is dealt with north of the capital, both on the Nordbane and the Kystbane. This is greatly augmented on Sundays and holidays, when, apart from the attractions of the sea coast, the Nordbane, with its woodland and lake scenery, induces very heavy travel. It will be noticed that the number of trains running in Zealand greatly exceeds the number running in other parts of the country, but this will be appreciated when it is realised that Copenhagen contains nearly one-fifth of the population of Denmark. The average number of passengers dealt with daily at the chief station is 20,000, and it may be noted that the



HELSINGÖR STATION, AND TRAIN FERRY WITH CARS FOR GÖTEBORG.

yards, inclusive of workshops, covers an area of 308 acres, and has over 56 miles of tracks. This compares with an area of 37 acres in 1911, which includes the stations already mentioned and the old workshops. The number of trains dealt with at the Hovedbanegaard is fairly considerable, and totals on weekdays 240, and on Sundays 293, exclusive of all empty or light movements. These numbers are slightly in excess of the 1914 figures, when the traffic was dealt with at the several termini. Of the total number of trains about 70 per cent. are those running over the Boulevardbane to the north and coast lines.

dweller in its suburbs is not compelled to abjure late hours, as after 11.30 p.m. round about a dozen trains depart daily. Mention has been made of Helsingör and its train ferry—this is the only International route on which the boats have single track. Through cars to Gothenburg and to Christiania (Oslo) and *vice versa* are transferred three times a day.

Sleeping cars to and from Stockholm are conveyed between the Free Harbour station at Copenhagen and Malmo (18½ miles), this service being jointly worked with the Swedish State Railways. The traffic to Germany is conveyed from Copenhagen to Gjedser, on the Island of Falster, by train

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ferry between Masnedø and Orehoved across the Vordingborg Bay, a distance of 2¼ miles. These steamers have only a single track, and the International trains are divided and the cars taken over by two vessels. From Gjedser to Warnemunde in Germany (28 miles) the ferry boat service is worked jointly with the German State Railways. This route, opened in 1903, employs the largest ferry steamers, some of paddle and some of screw type. The two tracks on these steamers have a clearance of 254 ft. and ordinarily take about seven large bogie vehicles. It may be mentioned that, though all the steamers on this route are of similar capacity, the cars are differently placed according to type of steamer.

The fastest express train runs on this Division compared with pre-war are :—

		Miles.	Best Train Speed. m.p.h.
1914 (5 runs)	Copenhagen–Korsör	68·35	41·40
1924 (4 runs)	,,	68·35	38·94
1914 (6 runs)	Copenhagen–Masnedø	77·16	39·54*
1923 (4 runs)	,,	77·16	36·71*
1924 (4 runs)	,,	75·86	36·39†

* Via Kjøge. † Via Ringsted.

Dealing with the through services, except for the through cars to Esbjerg, in connection with the English mail steamer, only the sleeping cars on the night services are taken over on the ferry steamers, but quite a number of postal and parcel vans, as well as, of course, goods vehicles, are transferred daily by this means. Exception is made in the service to Germany, in which case the entire train is conveyed on board the ferry steamers. Readers may be interested in the means employed on these ferry steamers for handling the through cars. The berths for the steamers are situated between two stone piers lined with wooden piles to fit the shape of the ship ; in the later designs the wooden pile structure is connected with the stone piers by a series of iron spring buffers. On reaching land the ship knocks against the wooden piles on one side, these yield, owing to the spring buffers, and ricochet gently to the piles on the other side until the ship is brought to rest with the railway tracks in alignment with those on the movable bridge connecting with the land railway. This bridge is moved according to tide by hoists. The through vehicles are detached from the rest of the train, and an empty vehicle placed between them and the shunting engine. For a single track ferry no preliminary operations are required, but, owing to the very sharp curves in the double-track ferries, it is necessary to place a wooden board between the buffers, to prevent locking, after the couplings have been loosened and the brake hose is disconnected. When the train is on the ferry-boat, the spring buffers are thrown into position behind the last car and each carriage is fixed to the rails by hooks and turnbuckles operated from the vestibules of their respective vehicles, in addition to which jacks are placed under the sides to prevent rocking on the springs. About 10 minutes is allowed to ship the cars and about 4 minutes for unshipping.

The chief through services from the Capital to Jutland are two morning services without through passenger vehicles and three night services, two of which have sleeping cars, to four destinations. The Esbjerg service, *en route* to England, runs four times per week, and is the fastest of the morning services. London is reached in about 27½ hours from Esbjerg, the trip to Harwich is made by the steamers of the United Shipping Company in about 24 hours. In the reverse direction the through carriage is worked back to Copenhagen as a sleeping car, together with the one ordinarily employed in the night service. By the morning trains Esbjerg is reached in about 7¾ hours, and Aarhus in 9 hours. The services to Germany are night and day in each direction, except in the winter, when the night service is cancelled. Through vehicles run to and from Berlin and Hamburg, the day connections reaching these places in 11 and 11½ hours, respectively. Third-class sleeping-car accommodation is now being tried, the car between Copenhagen and Randers being a composite of all three classes. If the experiment proves successful, it is intended to build third-class vehicles and to extend the services to other towns. The first dining cars in Denmark were introduced during the winter, 1922-23. They have proved very successful and work between Tinglev and Aalborg. However, it would be

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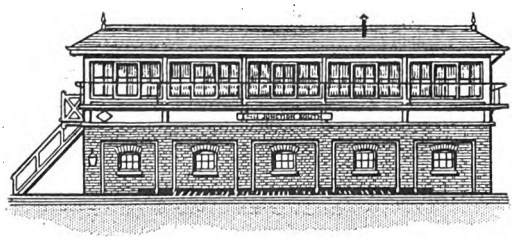
hardly practicable to introduce them in Funen and Zealand owing to the short journeys covered on these islands.

The passenger service is about 43 per cent. of the total dealt with, a small proportion of which is in the nature of mixed trains, which run quite extensively on the main routes. The local passenger services are subject to severe road competition, which is in evidence everywhere. Though road services are not frequent they often avoid the circuitous routes usually involved by use of the railway. In this connection the State railways are making experiments with rail motor-cars, a number of which are already in service on private lines. The summer of 1924 was marked by extensive holiday travel in Denmark, and the through services from Copenhagen to the provinces were duplicated almost daily from the middle of July. The traffic to England was also very satisfactory, and sometimes two and frequently an additional through carriage was run to Esbjerg. The number of passengers to London frequently exceeded one hundred on the days when the boat was running. Only the German services showed a diminution of traffic compared with the previous year. As already mentioned, the goods traffic—other than that for export—is the subject of great competition, but the State, wherever possible, has laid down harbour lines in order to gain a fair share of this business.

The punctuality of the train services appears to be quite good. The speeds at which the trains are booked allow a certain margin for regaining lost time. The greatest obstacle to punctuality in the through services is the breaking up of trains and their transport by ferry steamers, also the varied conditions of the weather. The only through services running late during the writer's experience were those in which the steamer portions of the journey were made under conditions abnormal to the summer weather enjoyed on *terra firma*.

In concluding these remarks, it is a pleasure to quote from the report issued by the Department of Overseas Trade on the "Economic Situation of Denmark." It is claimed that the railway services have now reached pre-war level. This has been obtained by the restriction of capital expenditure and economies in working; in particular, the cheaper purchases of locomotive coal, all of which is now imported from this country. Concurrently, the train services have been very much improved during the post-war years, and are now comparable with those in operation at the outbreak of war.

The writer tenders his sincere thanks to Mr. Gammelgaard, representing the General Director, Mr. Engelund, Bridge Engineer of the Danish State Railways, and to Mr. Matthiesen, Assistant Station Master at Copenhagen (Hovedbanegaard), for information embodied in this article.



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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT SOUTHERN AND WESTERN RAILWAY IRELAND. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

BY 1888 the speeds of the mail trains had been considerably improved, and the two expresses, one down and one up, averaged 4 hours 5 min., the speed, exclusive of stops, being 42 m.p.h. A new express between Cork and Limerick Junction appeared in 1889. Foxwell and Farrer, who mentioned them in "Express Trains, English and Foreign" (1889), pointed out that the two mail trains were the only real expresses in Ireland, and that the intermediate speeds were very brisk, and the fast trains very heavy. "Third-class accommodation is superior to that on many English lines, though *the* expresses are 'first and second' only. On Sunday the mail leaves Dublin at 7.20 a.m., reaching Cork 11.7 a.m. (first-class only), an *inclusive* speed of 42⅔." The weekday speed, inclusive of stops, was 40·4 m.p.h.

Mention of Limerick Junction above calls to mind one of the most extraordinary junction stations that ever existed, which may also be described as typically Irish. Limerick Junction is not really a place at all. What there is of it is a fairly large and commodious railway station situated in space. It is 22 miles south-east of the City of Limerick, and one would be inclined to think that the railway people would at least have planted it in County Limerick, but they did not. Irish like, they selected a pleasant country spot in County Tipperary, and left it there; at least, that is what the map says. Being in space, there is plenty of room for trains, and they all waited there a considerable time. The mails were booked to put in about 10 minutes at the station, and other trains rested for anything from 15 minutes to an hour. The justification for this appears to have been the number of contortions which all trains had to go through to get to the single platform. The front of this platform faced roughly E.S.E. and looked out over the open country in the direction of Tipperary. The principal architectural features of the place, other than the station buildings, consisted of an engine shed on the left front, a fairly large gasometer in the centre, which protruded violently into the view of the Galtee mountains, and a couple of haystacks *en échelon* on the distant right. The gasometer not only served primarily as a conspicuous landmark, but also had the secondary duty of supplying gas for the company's premises. At the back of the platform, forming part of the station buildings, there is a hotel, at which I once spent two nights very comfortably. Consequently, I had ample opportunity for observing the funny antics of the trains in this part of Ireland. These made considerable ado about getting into a station, which, when they did get there, wasn't anywhere at all.

Limerick Junction owes its origin to the fact that in its vicinity the Great Southern and Western Railway was crossed almost at right angles by the Waterford and Limerick Railway, then an independent Company, which the former railway absorbed in January, 1901. I use the word "vicinity" of set purpose, for the level crossing is about two hundred yards on the Dublin side of the station, though it may possibly be situated in the same county. The boundary of County Tipperary, I believe, runs perilously near the level crossing, though no accident is reported to have occurred from this cause. The Great Southern and Western has two roads, but the Waterford, Limerick, and Western was a single line running from south-east to north-west. How the crossing was connected

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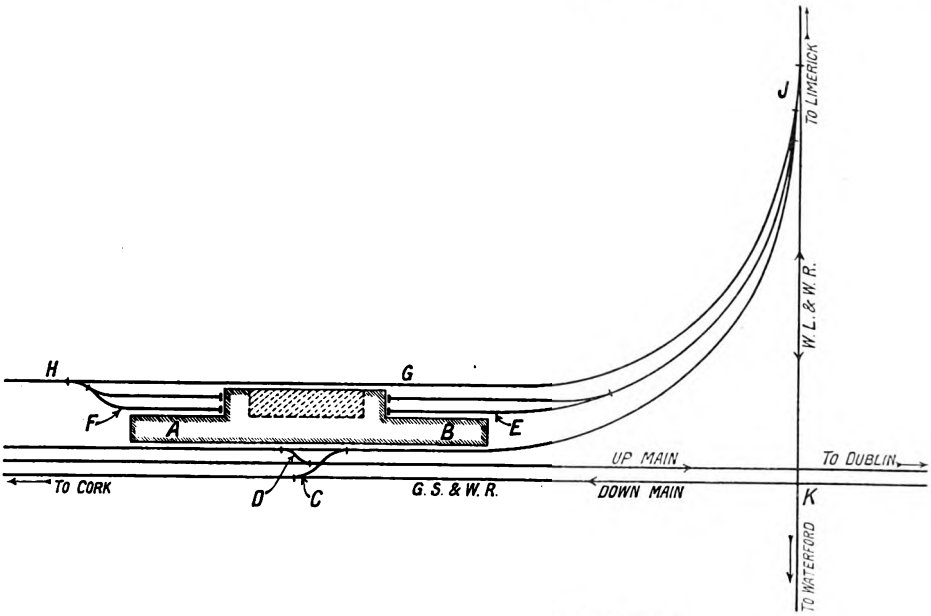
with the station will be described subsequently.

In the early days a passenger from Dublin or Cork to Limerick travelled to Limerick Junction, changed there, and then took the Waterford and Limerick Company's train. Afterwards the G.S. and W.R. made a "direct" line from Ballybrophy on the main line, 66¾ miles from Dublin, through Nenagh to a junction near Killonan, on the Waterford and Limerick main line, about 5 miles from the latter city, and worked its own trains into Limerick. The effect on the map was a sort of four-sided Irish triangle, the chief geometrical property of which is that the longest way round is the shortest way there. It is true that the distance from Dublin by the new line turned out to be 5½ miles shorter than the old route via Limerick Junction, but the passenger who went "direct" took anything from 15 minutes to 1 hour longer over the journey. To "shorten" the journey from Cork to Limerick a railway entitled the "Cork and Limerick Direct Company" was authorised in 1860, which left the main line near Charleville Junction and joined the Waterford and Limerick branch from Foynes at Patrick's Well. The distance from Cork to Limerick by this route was 61¼ miles, as against 80½ miles via the old route. By the new route one could travel from Cork to Limerick in about 3 hours by the best train, but as the time by the old indirect route was slightly better, Irishmen in a hurry made no alteration in their itinerary.

As there was apparently no place near the station at the railway cross-roads, some wag hit upon the bright idea of naming it Limerick Junction, because it was not such a long, long way from Tipperary.*

The rule at Limerick Junction station was that all trains, whether they came from Dublin, Cork, Limerick or Waterford, had to get to their respective platforms tail first. They went up the middle and down again, and then set to partners. The main line trains, by means of suitable cross-over roads, such as those at Cambridge or the old stations at Reading and Gloucester, could have reached the main platform, engine first, in the usual manner, but in Ireland they did not do things in that way. The *modus operandi* may be described with the help of the annexed diagram. A train from Dublin to Cork crossed the Waterford and Limerick main



SKETCH PLAN OF LIMERICK JUNCTION.

* The distance from Limerick Junction to the town of Tipperary is only 3 miles on the Waterford line. To Limerick City it is 22 miles.

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line at K and proceeded to a point beyond the cross-over points C, where it pulled up. It was then backed across the up main line to a third or platform line and drew up alongside the platform at B. On leaving for Cork it again passed through the cross-over to C, and went straight away. A train from Cork on the up line went through to a point beyond the cross-over points at D, and then backed to the platform line opposite A. The station work completed, the train had a straight run out to Dublin through the points D. So far the complication was not excessive, but the contortions of the W. and L.R. trains were fearful and wonderful. A train from Waterford to Limerick crossed the G.S. and W. main line at K and proceeded for a considerable distance to the junction at J. Incidentally, this was the real and only junction in the whole arrangement, and was not only a fairly long way from the station, but was situated entirely on the Waterford and Limerick metals. From J the train was backed into the bay E, from which it had a straight run out to Limerick. A train in the opposite direction from Limerick to Waterford came straight through from J, engine first, along the road G behind the Station Hotel, until it passed the points H, whence it backed into the bay line F, with the engine facing towards Cork. To go to Waterford, the train pulled out to H and then had to back along the road G to the junction J, whence it had a straight run across K. Two reversals were therefore necessary.

The time-tables of the two railways were so arranged that the down and up trains on the Waterford and Limerick Railway were both in the station to meet and connect with at least one, and frequently two, main line trains of the Great Southern and Western Railway. There were therefore two trains approaching the junction J within a few minutes of each other, and the one from Waterford had also to keep a sharp look-out for the crossing signals at K. If two G.S. and W. main line trains arrived at about the same time, they had to be clear of the cross-over roads at C and D, and when they were both at the main platform the two engines faced each other on the same line of rails, looking like a couple of cats—Kilkenny brand—which, had they been able to waggle their trains, would very likely have sprung at each other.

There is a commodious engine shed at Limerick Junction, which at one time formed the locomotive headquarters of what may be termed the central district of the railway. The shed, within my own recollection, was not tenanted on weekdays by many engines, several of which were at out-stations, such as Thurles and Charleville. Main line pilot engines were stationed both at Thurles and Limerick Junction, one being on daily duty at each station, in case a main line express engine failed. At one time the last two of McDonnell's 2-4-0 6 ft. 6 in. express engines, Nos. 64 and 65, were the pilots, but after these had been broken up, about 1897, their places were taken by the 6 ft. 6 in. 4-4-0 engines of the smaller 52 class. The pilot engine at Limerick Junction filled in its spare time with the shunting of horse-boxes, trucks, and general exchange traffic to and from the Waterford, Limerick and Western Railway.

In addition to the standard classes of locomotives described previously, there were a number of interesting nondescripts and special engines, mostly for departmental work. It has frequently been forgotten that the first modern type of combined steam motor engine and coach was designed by A. McDonnell, built at Inchicore, and used on the Castle Island and Gortatlea Railway in Kerry. There were three of these, built in 1880, though, I believe, there was a prior experimental engine of a similar sort dating from 1876, which may have been converted from an old engine. The standard steam motor-coach engines Nos. 90, 91, and 92 were small 0-6-0 tank engines, each with a combined first and third-class car behind, carried upon a trailing bogie. The six-coupled type appears to have been adopted for the reason that the engine and car had also to do the goods shunting work at the branch terminal stations. Of these engines No. 92 still retains the combined coach, and for a long time has been used to convey officials between Inchicore and Kingsbridge station, Dublin. Nos. 90 and 91 at some period in their career had the coaches removed, and were converted to independent 0-6-0 tank engines. The cylinders of these small engines were 10 in. by 18 in., and the wheels 3 ft. 7 in. diam.

Another branch line with 50-lb. rails, over which, like the Gortatlea branch, only special light locomotives were allowed

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to work, was the Fermoy and Mitchelstown Railway, 12 miles in length. For this line two somewhat similar engines, Nos. 99 and 100, but with side tanks, were built at Inchicore in 1890. The cylinders are 10 in. by 18 in., coupled wheels 3 ft. 8½ in. diam., total heating surface 362 sq. ft., weight in working order 23 tons 8 cwt., very nearly evenly distributed over the three axles. These were built as independent engines without coaches on the same frame.

The above five engines formed part of the regular locomotive stock of the company, but the nondescripts or departmental engines were, in a sense, without "caste." Some were part and parcel of departments outside that of the locomotive authorities, and to distinguish them from the real locomotives they bore names instead of numbers. This was similar to the practice of the London and South Western Railway about 40 to 50 years ago, when "old stagers," of which the locomotive people wanted to be rid, were sent to the Engineers' Department with compliments and a blessing. There appears, however, to have been a difference in the practice of the two railways, in that some of the departmental engines of the Great Southern and Western were specially built for the use of the departments concerned.

Chief amongst these were the *Sprite* and *Fairy*, small 0-4-2 tank engines, with 5 ft. wheels and 9 in. by 15 in. cylinders. These were the pay carriage engines, of which one, and sometimes both, were to be seen in the engine shed at Limerick Junction, with their small saloons attached. The arrangements for the weekly pay of the railway employees in the isolated districts of the west of Ireland had necessarily to be arranged in a different manner from those usual in this country.

Negro, *Jumbo* and *Sambo* were the euphonious appellations of yard shunting engines, and, as such, presumably, belonged to the locomotive department, which considered them in the light of duplicate stock. *Negro* and *Jumbo* were previously the 0-6-4 back tank engines Nos. 201 and 202, which, after about 20 years' service were translated to an "Upper House," with titles instead of numbers. The original *Sambo* was an old 0-4-2 goods engine of pre-McDonnell days, afterwards rebuilt as a saddle-tank engine, which pottered about Inchicore Works until his demise in 1913. After his disappearance a new *Sambo* was built to perpetuate his memory.

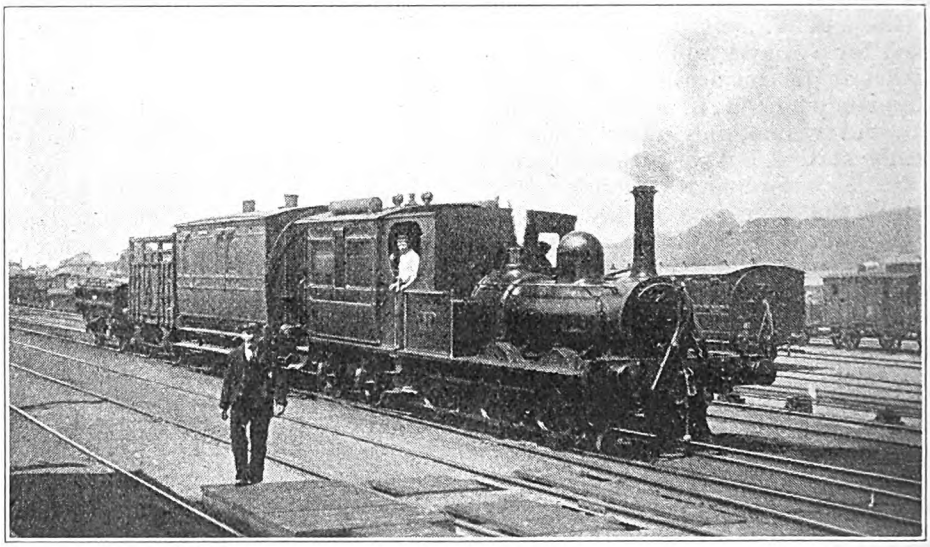

Photo.] [*Loco. Publishing Co. Ltd.*

0-6-4 COMBINED TANK ENGINE, No. 92, AND COACH (1880).

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In 1891 the down and up mail expresses (first and second class only) were timed as below :—

DOWN.

Miles.		arr. a.m.	dep. a.m.	Speed, m.p.h.
	Dublin	—	7.40	
				42¼
30¼	Kildare.. ..	8.23	8.26	
				42½
51	Maryborough ..	8.56	8.58	
				43·8
107¼	Limerick Junc.	10.15	10.22	
				42·1
165½	Cork	11.45	—	

UP.

Miles.		arr.	dep. p.m.	Speed, m.p.h.
	Cork	—	2.10	
				43·7
58¼	Limerick Junc.	3.30	3.35	
				43¼
114½	Maryborough ..	4.53	4.55	
				41·1
135¼	Kildare.. ..	5.26	5.29	
				39·4
165½	Dublin	6.15	—	

The two longest runs were 58¼ and 56¼ miles in both directions. But these did not represent the longest distances which had been run without stopping on the Great Southern and Western Railway, since Mr. McDonnell stated that in the 'seventies one train ran through from Dublin to Thurles, 86¾ miles.

The 9.15 a.m. down day express ran from Dublin to Portarlington, 41¾ miles, in 67 min., speed 37·4 m.p.h., after which it became a semi-fast train, of which the best and longest run was from Limerick Junction to Mallow, 37¼ miles, in 59 min.

The 10.15 a.m. and the 7.45 p.m. night mail ran as in 1880, but there was an additional evening down train, the 6 p.m. from Dublin, which ran to Kildare in 50 min., but did not reach Cork until 11.23 p.m.

Of the up trains only the 12.35 p.m. from Cork need be mentioned. This ran from Mallow to Limerick Junction in 60 min., speed 37¼ m.p.h., and from Portarlington to Dublin, 41¾ miles, in 71 min., though I think that a few minutes of this should be ascribed to the exigencies of ticket collecting.

Some of the business trains between Cork and Queenstown were fairly smart. The 9.30 a.m. up and the 5.20 p.m. down ran between Queenstown and Cork (Summerhill), about 11¼ miles, in 20 min., with one stop at Rushbrooke. The down and up mail trains used Glanmire station at Cork, and ran between there and Queenstown without stopping in 25 min. All these trains were worked by the 0-4-4 tank engines.

It will be noticed that the departure time of the down mail from Dublin had been made earlier. In 1880 it was 9 a.m., but a few years later it became 7.40 a.m. On the other hand the up mail from Cork was delayed until 2.10 p.m. As the down train arrived at Cork at 11.45 a.m., there was just time for a Cork merchant to write a hurried reply to an important letter to reach England the next morning. With the old train timings this had been impossible.

But 7.40 a.m. meant an early breakfast in Dublin, all the earlier because Kingsbridge station is well on the west of the city at the end of the quays on the south side of the river, and therefore at a considerable distance from the centre. There was no breakfast car on the train; this was not put on until 1898, when the train was re-timed. The train consisted generally of seven six-wheeled coaches, weighing rather less than 90 tons, or, say, 105 tons when loaded with mails and passengers. There were two portions, of which the three coaches at the back, consisting of one second and one first-class carriage, and one guard's van, had been brought round to Kingsbridge from North Wall by a Great Southern and Western tank engine. These were followed into Kingsbridge by the mail train proper, which had come round from Kingstown in charge of a Dublin, Wicklow and Wexford engine. This portion formed the front of the complete train, and consisted of a P.O. van, one first and one second-class coach, and a parcels van. The whole train ran through to Queenstown. The engines at this time, and until the year 1900, were invariably of the 4-4-0 60 class, with 18 in. by 24 in. cylinders and large 2,730 gallon tenders.

Although Mr. Ivatt introduced no new designs for the express and goods tender engines, he built new types of passenger and goods tank engines. Of the former six, built in 1892 and 1894, were of the 2-4-2 type with leading and trailing radial axle-boxes and side tanks. The cylinders were 16 in. by 20 in., and the coupled wheels 5 ft. 8 in. diameter. These

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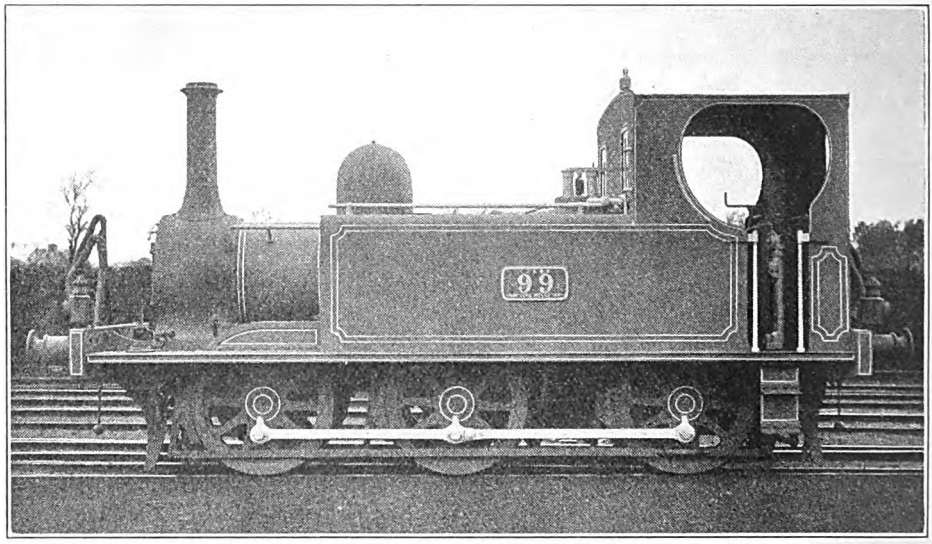
dimensions were standard for several classes of engines on the line, as also were the boilers with raised fireboxes, introduced by McDonnell, a feature which characterised an old but efficient design. The total heating surface was 853½ sq. ft., pressure 160 lb., tank capacity of the first four engines 1,250 gallons, reduced in the last two to 1,130 gallons. The weight in working order of the first four of 1892, Nos. 33, 34, 41 and 42, was 46 tons 12 cwts., of which the coupled wheels carried 24½ tons 6 cwt. The last two engines, Nos. 35 and 36, built in 1894, were somewhat lighter.

These engines were employed on the branch lines in County Kerry between Farranfore (on the main Killarney line between that place and Tralee) and Valentia Harbour, and also on the Kenmare branch.

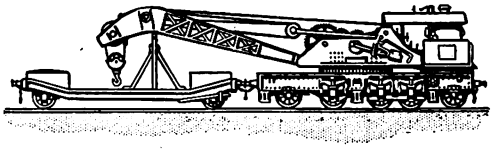


LIGHT 0-6-0 TANK ENGINE, No. 99.

Built in 1890 for Fermoy and Mitchelstown line.

Correction:—In the April number, page 273, I mentioned in error that Mr. McDonnell left the G.S. & W.R. for the N.E.R. in 1881. He entered the service of the latter railway in April, 1883.

(*To be continued.*)



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1825-1925.

V.—PASSENGER AND FREIGHT ROLLING-STOCK.

By G. A. SEKON.

THE centenary of the first passenger coach on a railway occurs at the same date as the centenary of the railway system. Having obtained powers to levy a toll of 6d. per mile on "every coach, chariot, chaise, car, gig, landau, wagon, cart or carriage using the railway for the conveyance of passengers or parcels," the Stockton and Darlington Railway provided for the opening ceremony a vehicle to convey passengers. This first railway carriage is described in the official announcement as "the coach* belonging to the company," named significantly "Experiment," thereby disclosing the tentative character of the development.

No great interest in railway history was apparently taken by the general public until Dr. Samuel Smiles, the then Secretary of the S.E.R., took to writing the history of the early engineers. In describing the career of George Stephenson, Smiles naturally had much to say regarding the S. and D. Railway. Unfortunately his description of the "Experiment" was such that it gave the impression that the first passenger coach of the first passenger railway was a caravan on railway wheels. It was far from being so. It was built on the plan of the road "Long Coaches" as continued in omnibuses till the end of the 19th century. The passengers sat in two rows with their backs to the sides of the vehicle, and therefore each row faced the other. The "Experiment" was provided at each end with a door—necessary if the coach was not to be turned at the end of a journey—windows in the side, a table down the centre, and, still following the coach idea, seats on top with steps to reach them. The "Experiment" was constructed by a coach-builder of repute and cost the S. and D. Railway £80. It is assumed the wheels were within the frames—a seat along each side, room for the legs of two rows of people plus a table within, were not possible in a space of 4 ft. 8½ in.

The "Experiment" was to run daily between Stockton and Darlington, and the directors of the S. and D. Railway having found it would be necessary to procure a licence for it to ply for hire, some delay occurred before the legal formalities were complied with, and it was not until October 10, 1825, that the regular passenger service was provided. The coach was let to a contractor for £2 2s. per week, the railway advancing this man money to purchase a horse to draw the coach and harness. As any one complying with the railway's regulations could run coaches on the line there were soon several competing for the passenger traffic. These later coaches, which were chiefly provided by the local innkeepers, appear to have been stage coaches, fitted with railway wheels and with conveniences for fixing the portable shafts at either end of the coach. These coaches were more comfortable than the "Experiment" and higher fares were charged the inside passengers by them, the outside fares being the same as the inside fare by the "Experiment." It will be seen, therefore, that almost from the first, two classes of passengers were catered for on the railway.

After running on various sections of the S. and D. Railway, the "Experiment" was used as a cabin* in December, 1827 and placed at the foot of the Brusselton

* Those responsible for early railways could not dissociate the new means of transport from the then-existing conditions. A (stage or mail) coach was the recognised vehicle by which people (as the public) travelled, so the vehicle provided for the purpose was designated a coach, and coach remains the technical description of a railway carriage to-day, whilst the passenger department is still referred to as the "coaching" department. The same idea of adopting existing words to describe a development is found in that of chauffeur, applied to a paid driver of a road motor. A chauffeur is merely a fireman of a locomotive on French railways.

* Old railway carriages have continued to be used for cabins for railwaymen up to the present time.

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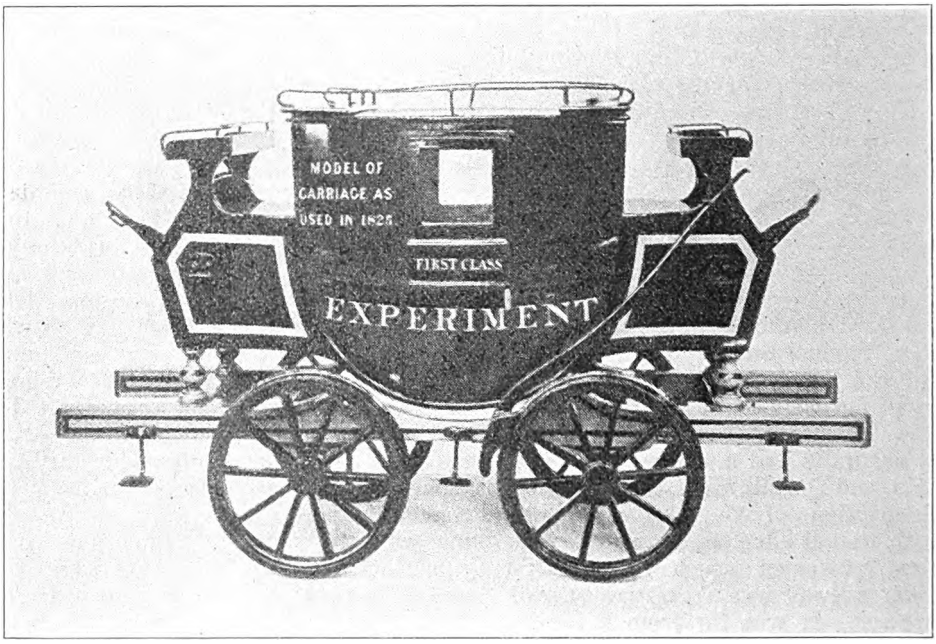
incline for use of the bank riders. After a brief use in this way an accidental fire destroyed the historic "Experiment."

In 1839, common road coaches were still running on the Stockton and Darlington Railway, but the usual type of first-class and open second-class carriages were also in service; some of the latter had four compartments, and measured 14 ft. 7 in. in length by 6 ft. 9 in. wide. Third-class passengers were carried on the top of the luggage vans, 24 being accommodated per van. The second-class carriages and luggage vans were attached to the goods trains, the passenger trains being first class only.

In considering the small size and weight of early railway carriages, it should be remembered that the initial idea of railway companies was merely to provide a rail *road* upon which anyone could run vehicles on payment of tolls. The railway companies' first thought was to preserve their permanent way from undue wear. Heavy vehicles meant quick destruction of the light permanent way, so in acts incorporating early railways a clause* was usually inserted limiting the weights of a 4-wheel vehicle to 4 tons, including load, and of 6-wheel vehicles of 6 tons, including load. These weights for several years practically precluded the use of coaches bigger than those described on the next few pages.

The Liverpool and Manchester Railway (1830), constructed for the conveyance of passengers, might conceivably have been expected to have had designed vehicles such as the needs of a railway would suggest. Apparently those responsible for the provision of the coaching stock looked upon the railway merely as a road upon which stage coaches could run more easily on rails and travel at higher speed than by horse haulage. The result of this restricted mental outlook was that the passenger vehicles on the L. and M. Railway were merely road coaches mounted on railway wheels.

So much so that the best class were



MODEL OF "EXPERIMENT" COACH AS INTRODUCED LATER IN 1825.

This illustration, based on a Science Museum photograph, shows a coach which replaced the original "Experiment" after a few months' service.

* Made nugatory by Act of 1842.

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called "mails" (*i.e.*, mail coaches) and the others first and second class. Moreover, the directors found it so hard to dissociate the idea of passenger travel from the usual features of highway vehicles that the railway carriages were given names, *e.g.*, *Times*, *Despatch*, *Greyhound*, &c. The mails had the appearance of three coach bodies joined together, and had seats in the three compartments for 12 passengers. The interiors had cushions and upholstery of drab cloth and the seats were separated by stuffed elbows. The first-class coaches were practically similar, save that each seat accommodated three instead of two passengers.

The second-class carriages were not so good. They were in three compartments, seating four a side, had roofs and ends, but were open at the side above the waist. The wheels of all the carriages at first were of wood with metal tyres, then cast-iron wheels with wrought-iron tyres were employed, but after a few years' trial the wooden wheels were again employed.

It was soon evident to the directors of the trunk lines under construction in 1835 that the stage coach was not an ideal type of vehicle for a long railway journey. The London and Birmingham and G.W. Railways offered prizes of £200 and £100 for the best design for railway carriages.

The view was prevalent that the centre of gravity must be kept low, and the conditions stated (*inter alia*) that the bottoms of the coaches were not to be more than 14 in. above the ground, and the width of the bodies was not to exceed 7 ft.

The L. and B. Railway does not appear to have constructed coaches with floors so little above the rails, but the G.W. Railway made trial with a carriage between the wheels of the 7 ft. gauge, whilst other G.W. coaches had the wheel projecting through the floors (boxed in) with a view to keeping the centre of gravity low.

The carriages on the Newcastle and Carlisle Railway (1835) were highly commended by Whishaw, who remarked that the first-class are fitted up with every regard to ease and comfort. The sashes of these first-class carriages were "entirely free from the chattering noise so annoying in most railway carriages." He urged that this improvement should be introduced in all first-class railway carriages. In addition to the first-, first- and second-composite, and second-class carriages with open sides, there were on the Newcastle and Carlisle Railway luggage coaches with seats outside. On this railway the classes were shown by distinctive colours—first-class coaches were painted yellow and picked out with black; second-class painted white, picked out with green; whilst the luggage carriages and horse-boxes were painted green. On busy days movable seats were fixed in goods trucks, which were attached to the passenger trains so that "almost any number of passengers may be accommodated."

The floors of the carriages of the Greenwich Railway (1838) were only 22 in. above the ground, the wheels, coming through the bottom, were encased. An advantage claimed for these low-hung carriages was that steps were not required to enter them; this, however, was more than counterbalanced by the absence of buffers, from which the carriages of the London and Greenwich Railway suffered. The second-class carriages on this line, as well as on the Manchester and Bolton Railway, had the seats all around the sides and down the middle, with one door on each side. On the latter railway the second-class carriages, although provided with a roof, were only enclosed at one end, the other end, as well as the sides, being open. Without definite information on the point, we presume the carriages were turned at the end of each journey, so that the closed end was always in front, and afforded protection from the draught caused by the passage of the train.

With the opening of the Manchester and Leeds Railway—July 4, 1839—came some innovations in the carriages. In the first place names were discarded and numbers substituted, whilst a run of consecutive numbers was reserved for each class—Nos. 1 to 50 for third-class, 51 to 100 for second-class, and from 101 upwards for first-class. A continuous lower footboard was provided in place of an iron step below each door, an innovation which added to the safety of those using the step, as with the continuous footboard if a slip were made there was little likelihood of the person falling on the line and being

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run over. The continuous footboard was also of advantage to ticket collectors in passing along the trains when in motion.

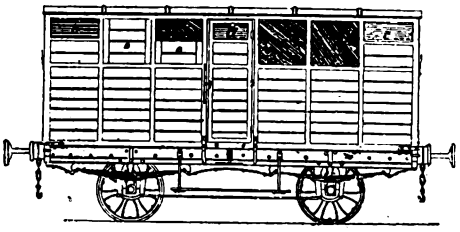
It is of interest to note that despite the obvious advantage of continuous footboards they were not generally employed by railways until near the close of the last century.

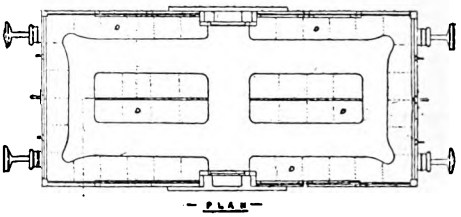
The second-class coaches had not glazed windows, but an elliptical opening in the centre panel of each compartment, of which there were three. The third-class or "Stanhopes" on the Manchester and Leeds Railway were of peculiar shape. The body was 17 ft. long and 8 ft. 8 in. wide, except that at the ends, for a distance of 18 in., the depth was decreased to only 5 ft. They were divided into four pens by means of a central longitudinal bar, and a central cross bar at right angles. Each pen was provided with a door. The Stanhopes were, of course, roofless and without seats. Their capacity "depended upon the bulk of the respective Stanhopers." A writer of the period suggested that the third-class passengers should be provided with seats "to distinguish them from the brute beast which perish."

The London and Birmingham Railway (1838) provided "super" first-class (or mails), seating two aside, whilst first-class coaches seated three aside in a seat-space of 6 ft. 6 in., and a longitudinal width of 5 ft. 4 in. These carriages, contained three compartments, the luggage was stacked on top, and the guard rode on a dickey. One was provided at each end so that the guard could always ride with his back to the engine. These vehicles weighed 76 cwt. each. Second-class passengers by the night trains of the L. and B. Railway were conveyed in enclosed coaches, each with three compartments. In addition to the drop lights in the doors, oval quarter-lights were provided. The interior partitions between the compartments extended only 18 in. above the bare wooden seats. The day second-class carriages were open at sides, but roofed; spring buffers were not provided.

Two designs of first-class carriages were provided by the G.W.R. (1838) upon the opening of the line. One on six wheels, 31 ft. long with four compartments, the other 18 ft. in length carried on four wheels, had three compartments, both were 6 ft. 6 in. high and 8 ft. wide, and were provided with a clerestory, in the sides of which, for ventilation, were openings covered with wire gauze closed by a sliding panel. It will be observed that these dimensions were on a more liberal scale than those of narrow gauge first-class carriages. Some of these broad gauge coaches were divided across the breadth of the compartment by a folding door, which divided an ordinary compartment seating eight (four a side) into two compartments seating four (two a side).

The G.W.R. commenced operations with enclosed second-class carriages carried on six wheels, and containing six compartments, each seating on upholstered benches 12 passengers (six a side). The guard shared one of these compartments with the passengers, and actuated the hand brake which applied blocks to four of the wheels. It was found that on the score of economy many people who, it was





BRIGHTON, CROYDON AND DOVER RAILWAYS.
THIRD-CLASS PARLIAMENTARY CARRIAGES FOR 48 PASSENGERS.

AA—Openings which were closed in wet weather by raising the shutters, BB.
CC—Ventilating louvre boarding, admitting light and air when the shutters were closed, which would seldom or never happen. DD—Seats for passengers.

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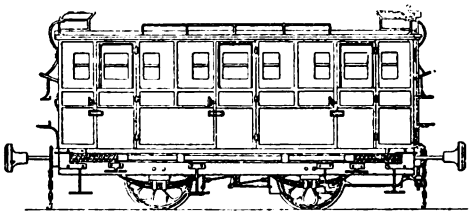
expected, would patronise the first-class, travelled in the enclosed second-class coaches, so that railway had the sides removed above the waist thus making them roofed open coaches. In 1844, when third "Parliamentary" passengers had to be conveyed in covered carriages several of the open second-class carriages were again enclosed and retained as second-class. Those not enclosed were used for third-class passengers travelling in the few trains that conveyed third-class as distinct from Parliamentary passengers.

The Newcastle and North Shields Railway (1839)—a Tyneside suburban line—purchased some of its first-class carriages second-hand from the Liverpool and Manchester Railway. In the second-class carriages, the seats were only 12 in. wide and the space between the two seats of a compartment only 17 in. A continuous iron footboard was provided. The fares were distinctly marked on the panels of the carriages, 1s. on the first class and 6d. on the second. The former carriages were painted lake.

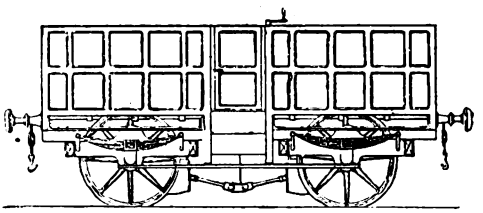
The Eastern Counties Railway (1838), although a byword among railways in the "'fifties," "'sixties" and "'seventies," commenced business with carriages superior to those of most railways. They are described as being "altogether of handsome appearance, painted blue with the arms of the company emblazoned on either side." The commendation, however, can scarcely be said to have applied to the third-class vehicles, which were merely open platform trucks with eight transverse seats for five people each. Eight-wheel carriages, 9 ft. wide in the body, were put into service on the North Woolwich branch of the E.C.R. in the autumn of 1847. The wheel base of these coaches were 30 ft., the axles being radial on Adams' plan; the coaches were built by this firm. They were 40 ft. long and consisted of a first-class saloon and three second-class compartments.

The buffers turned radially with the end axles instead of being fixed at right angles to the buffer beams of the coaches. The extreme width was obtained by the omission of footboards outside the carriages. The usual width of a railway carriage at this time was 7 ft. or 7 ft. 6 in.

The Regulation of Railways Act, 1844—the third-class passengers "*Magna Charta*"—made compulsory from November 1, 1844, by one train daily enclosed carriages for third-class passengers at a fare of 1d. per mile. The Board of Trade had to approve the third-class coaches provided for "Parly"* passengers. The railways exercised much ingenuity in complying with the regulations as to seats, windows, ventilation, &c., so that passengers should obtain as little as possible advantage and comfort. The L. and S.W.R., for instance, provided daylight by means of skylights in the roof so that "Parly" passengers could not see the surroundings *en route*.



Second-class Carriage.



Third-class Carriage.

BIRMINGHAM AND GLOUCESTER RAILWAY VEHICLES IN 1849.

The First International Exhibition (1851) caused the S.E.R. to provide in 1850 a "Grand European Railway carriage," which was really two four-wheel carriages, with buffers only at the outer ends, the adjacent ends of the vehicles being joined together by an arrangement of hinges to give flexibility. These coaches were for first-class passengers, they measured about 42 ft. in length and were carried on eight wheels. The compartments, of which there were four in each carriage, were arranged with seats at each end as usual = 6, seats for two each side of the two doors = 8, and a

* The abbreviation used to designate the Parliamentary train run to fulfil the conditions of the Regulation of Railways Act, 1844.

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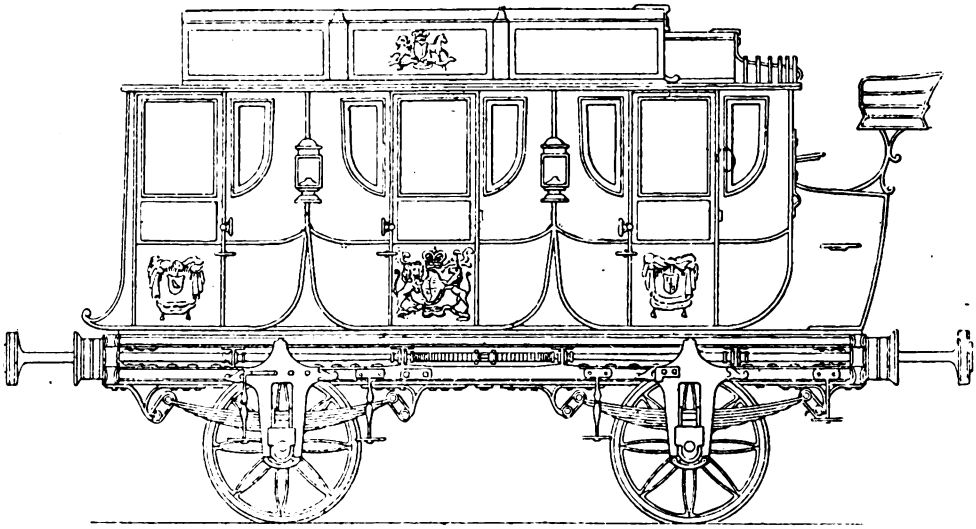
settee in the centre seating four, so that 18 passengers were conveyed in each compartment or 72 in the carriage. This was a big increase on the 18 seats in a three-compartment first-class carriage of the period.

The S.E.R. from 1851 onwards constructed its coaches of teak. This wood withstands the ravages of time and weather in a remarkable degree and therefore needed infinitesimal annual reserves for depreciation—a circumstance which suited extremely well the finances of struggling railways. But this desirable quality of teak wood made vehicles still sound in limb quite out of date, particularly in the matter of cubical capacity when judged by rolling-stock built 50 years later.

The S.E.R. met the position by upholstering (about 1890) all third-class carriages which were sufficiently wide to leave a seat 15 in. or over in width when upholstered. Compartments to the number of seven from two of these teak coaches were in the "'nineties" placed on one frame and supported on six wheels forming for a British railway a unique third 6-wheel coach seating 70 passengers. In the process of rebuilding the bodies were made about a foot higher, a great improvement, and one which prevented these long carriages looking asymmetrical. A number of these 7-compartment coaches were put in service; they continued to run for many years. The same principle is now being applied at Ashford to provide bogie coaches for the Southern Railway's electric trains.

In 1854 the S.E.R. commenced to build second-class carriages with stuffed seats and backs upholstered in leather and fitted also with glazed quarter lights (windows each side of the door). From the same date this company decided that in future all third-class carriages should be roofed; but the open thirds continued in use for many years after—until they wore out.



FIRST-CLASS "BED-CARRIAGE," LONDON AND BIRMINGHAM RAILWAY.

In the middle "'fifties" it began to be recognised by the railways that third-class passengers might be given a roof to the vehicles in which they travelled. But when covered third-class carriages were provided the body was usually only 20 ft. long, and frequently five compartments were squeezed into this space, providing less than 4 ft. for two seats and the door. The partitions were carried up to a height of only 16 in. or 18 in. above the seats, which were bare boards. Passengers travelling in these vehicles had to sit with their knees more or less interlocked with those of their *vis-à-vis*. The daylight entering these carriages was through the sash of the door, which was

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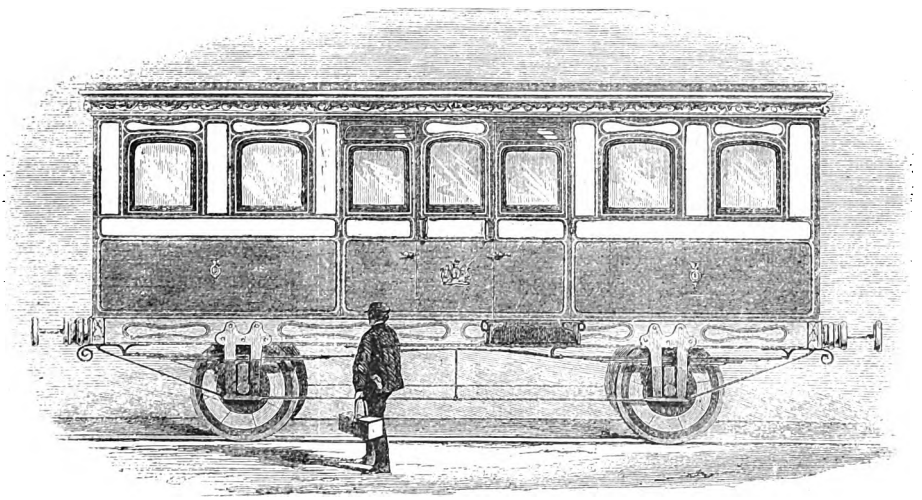
provided (as now) with a glazed drop light. A later regulation required the carriages to be provided with 60 sq. in. of window space per passenger, as the drop light only amounted to about two-fifths of the total, the upper panels of the sides were cut away and quarter lights were introduced. Quarter lights were usually rectangular, but on one section of the Midland Railway crescent-shaped windows were introduced in the coaches.

Doncaster, in 1858, turned out what a railway newspaper described as "a Great Northern Monster carriage." The vehicle weighed only 14 tons, was carried on but four wheels, was 40 ft. in length, and consisted of six first-class compartments. The railway paper considered the wheelbase too long and the springs too weak, but a railway carriage of these dimensions and weight was certainly a praiseworthy effort towards the production of bigger coaches of moderate tare weight.

A decided forward movement in carriage construction set in about 1870. Several railways up to this date had carriage works, in which carriages were repaired, no great amount of new construction being undertaken. Already in 1865 the L. and N.W.R. has concentrated its carriage works at Wolverton. The Midland Railway carriage works at Derby were erected in 1876. The introduction of Pullman cars and the abolition of second-class on the Midland Railway acted as a spur to competitive lines. The utilisation by the Midland Railway of its second-class coaches for the third-class traffic, immediately raised the scale of comfort on that line; other railways in competition with the Midland were obliged to provide more comfortable third-class carriages.

It will probably be news to many of our readers that the Midland Railway in 1872 introduced a German railway carriage, which was employed in the Leeds and Bradford district. The vehicle was built at Nuremburg and contained a first-class, first coupé and two second-class compartments. It was carried on 4 wheels, the wheelbase was 14 ft. 6 in., the body was 24 ft. long, 8 ft. 6 in. wide and 6 ft. 6 in. high, the second-class compartments had one arm in the centre of each seat, with room for two passengers each side of it. The roof lamps, door handles, Roman numerals to distinguish the classes, and fittings generally were those usual on German railways 50 years ago. The vehicle which was painted green, instead of the usual Derby red, and numbered 146, was withdrawn from service in 1880 as railway passengers did not take kindly to a railway carriage "made in Germany." The German coach was scrapped in 1886.



QUEEN VICTORIA'S SALOON CARRIAGE, LONDON AND NORTH WESTERN RAILWAY.

The Midland Railway in 1875 commenced to build bogie coaches 54 ft. long, with clerestory roofs to match the

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Pullmans. Considerable improvements were introduced in the interiors, the partitions between the third-class compartments were carried right up to the roof, instead of reaching about 18 in. above the seat or 3 ft. 6 in. above it, as in the better type of third-class coach. Moreover the penny per mile passenger, who now could travel by the fastest trains on the Midland Railway, was in these bogie coaches provided with stuffed backs as well as cushion seats. Pullman cars were introduced in the London–Brighton service in 1875.

About 1876 a flexible arrangement of the axles of six-wheel railway carriages was patented by Cleminson. Each axle was provided with a separate truck. The end axles were centrally pivoted and inner ends of these trucks were connected with the central truck. The movement of the centre pair of wheels was a sliding one, parallel with the main frame of the coach.

Probably the first close-coupled bogie trains were those put into service in 1880 by the S.E.R. The coaches forming these trains, which were constructed at the Ashford Works, were 43 ft. long and were supported on four-wheel bogies. They had a central buffer at each end instead of the usual pairs of side buffers. The first-class had six compartments, the second-class seven and the third-class eight compartments. The interior fittings were also somewhat in advance of those of contemporary suburban coaches, although partitions of alternate compartments in the third-class carriages were carried only about half-way up. These carriages measured 8 ft. 4 in. wide and 8 ft. 0½ in. from floor to roof at centre. The end vehicles of the set had a brake compartment and six third-class compartments with the usual long side buffers at the brake end. In one respect these coaches may be considered the best bogie coaches ever constructed from the railway point of view. They weighed only about 20 tons each, and the third-class seated 4 passengers to the ton, against 3 passengers to the ton of modern 10-compartment third-class coaches. Several of these centrally coupled bogie trains were constructed, and although built about 45 years ago some are still in service.

In 1881 the G.E.R. provided for its suburban trains specially designed coaches for first-class passengers desiring to smoke. These contained three compartments, each 7 ft. 9¼ in. between partitions of which space 3 ft. 4 in. was between the seats. In this space an elliptical table was fixed 4 ft. 2 in. long and 1 ft. 10½ in. wide at the centre, therefore leaving plenty of circulating space near the doors, as well as leg room generally.

In July, 1882, the L. and N.W.R* introduced drawing-room cars in its London-Liverpool services. At that time train marshalling on the L. and N.W.R. was largely done by turntables, and since these would not accommodate vehicles over 33 ft. long with a wheelbase of more than about 20 ft. "twin" drawing-room cars were provided. The twins were each of the 33-ft. standard length of L. and N.W.R. 6-wheel carriages, and were connected by a flexible gangway over the buffers at one side. One car was for ladies. These cars were heated by hot water, gas-lighted, and an attendant travelled with them who provided tea, &c. It was not till 1883 that the L. and N.W.R. commenced to build 8-wheel carriages, even then bogies were not employed but Webb's* radial axles. No vehicles over 42 ft. long, however, were built with radial axles.

Well into the "'eighties" of last century the practice of reserving one compartment of a coach for luggage persisted, and on the L. and N.W.R. and Midland Railway particularly, six-wheel coaches with four passenger compartments and a luggage locker in the centre, were usual in main line trains not so many years ago.

The N.E.R. carriage works at York were opened in 1884, and the N.E.R. at once commenced to build bogie coaches, discarding 6-wheel construction. The first N.E. bogie coaches were 48 ft. in length, soon after increased to 52 ft. The clerestory was adopted, and remained standard on the N.E.R. till recently, when the elliptical roof superseded it. The third-class bogie coaches seated 80 passengers in eight compartments.

Between 1886 and 1890 several railways provided lavatory accommodation on long-distance trains—mostly to first and second-class carriages, whilst in the latter year the Midland Railway was so fitting

* Mr. Webb was Chief Mechanical Engineer of the L. and N.W.R. from 1871 to 1903.

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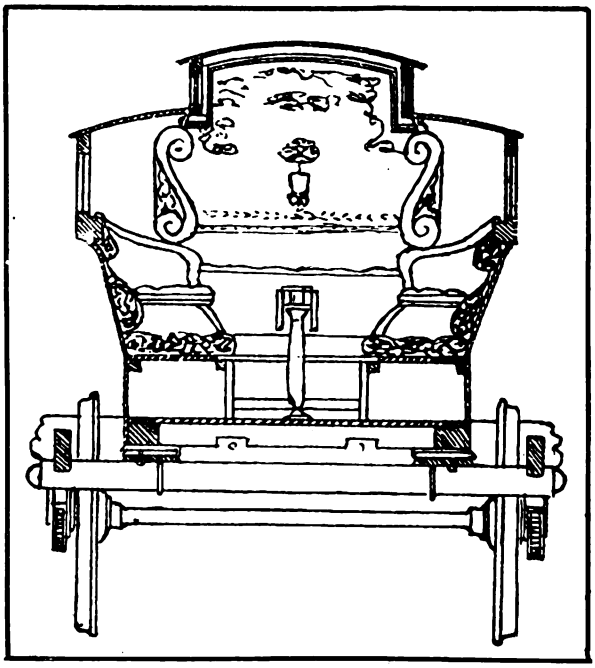

SECTION OF "THE GRAND SALOON CARRIAGE," ONE OF THE FIRST COACHES CONSTRUCTED FOR THE GREAT WESTERN RAILWAY.

third-class coaches. The general practice was for a seat to turn up, and the back of the turned-up seat to be the door of the lavatory, a most inconvenient and objectionable arrangement. A compartment was usually stripped of its fittings and converted into two lavatories by a diagonal partition, the two lavatories each served one compartment. This arrangement was wasteful of space as the lavatories were about 6 ft. across. Allowable in the case of coaches having a compartment converted into two lavatories it is somewhat surprising to find that new vehicles were constructed on the same method, the Midland Railway in 1890 building third-class lavatory coaches, with four compartments and two (diagonal) lavatories to the standard of the 31-ft. 6-wheel five-compartment third-class carriages. About the same time the Cambrian Railways built some six-wheel tri-composite brakes with lavatories. The arrangement was half first-class compartment, lavatory, third-class compartment, luggage compartment, third-class compartment, lavatory, half second-class compartment. The entrance to the lavatories was by turn-up seats and each lavatory space compartment was divided diagonally into two lavatories. Seats were provided for four first-class, four second-class and 20 third-class passengers. The length of these carriages was 31 ft. 11 in. over headstocks, the lavatories being 3 ft. 6 in. wide, against the 6 ft. in the Midland Railway coach previously described.

In connection with the Paris Exhibition of 1889 a late afternoon service was run in both directions between London and Dover by both the S.E.R. and L.C. & D.R. The trains were 1st class only, and consisted of vestibule drawing-room and buffet cars, provided by the International Sleeping Car Co. The exteriors of these trains were painted green. The service *de luxe* did not prove a financial success and was discontinued when the Exhibition closed.

The trains were, we believe, then transferred to the Continent, and there worked in the services of the Sleeping Car Co.

In introducing the "Cornishman" corridor train in 1890, the G.W.R. provided accommodation for first, second and third-class passengers, this train was then the only three-class corridor train in the country. The coaches had side corridors, except through the smoking compartments of the first and second-classes, where the gangway passed down the centre. The longest of the coaches were 56 ft. over headstocks, but at this time 50 ft. was the standard length of the G.W.R. bogie coaches.

New Pullmans were introduced on the L. & S.W. and L.B. & S.C. Railways in the spring of 1893. The three on the Brighton Railway were the largest passenger vehicles in this country, measuring 60 ft. 8 in. over buffers, the two for the L. & S.W. were 2 ft. shorter; four-wheel bogies were employed for all the cars.

In 1895 the G.W.R. introduced tri-composite bogie carriages, the bodies were 58 ft. long and 8 ft. 6 in. wide. The accommodation comprised a guard's compartment, four third-class compartments connected by corridor with two lavatories,

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one second-class lavatory compartment, and one 1st and one 1st coupé compartment with lavatories; 12 of these coaches were constructed.

Corridor trains were placed in service on the East Coast Route to and from Scotland on July 1, 1896.

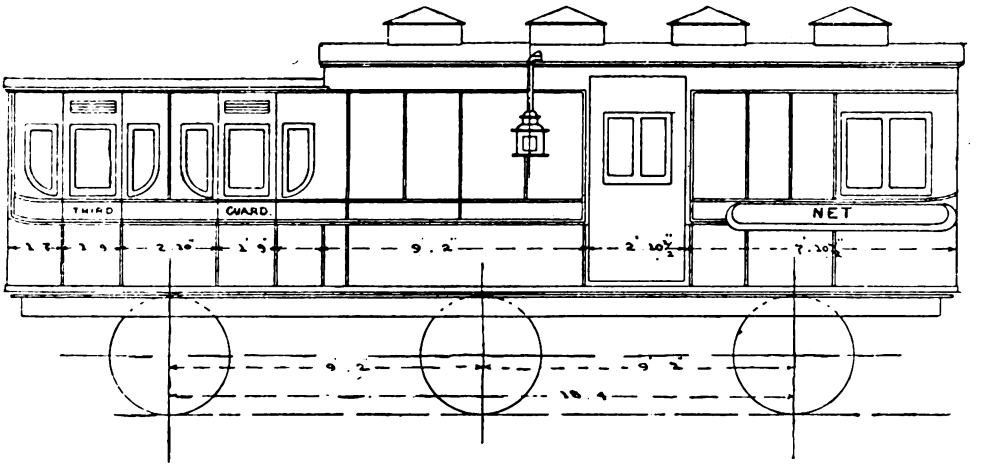
At the end of 1896 the S.E. Railway created an innovation by putting into service between London and Hastings a vestibuled train of six American cars. The train was steam heated and lighted by electricity. These cars had for some few years previously been running singly in various S.E.R. trains, chiefly in the London-Folkestone service. They were originally built in the United States, but, prior to forming the Hastings-American Car Train, were overhauled at Ashford Works. A few months later there were built at Birmingham for the S.E.R. a vestibule train of eight coaches (two first-class, one second-class, two third-class and two third-class with brakes), fitted with American vestibules and centre couplers, in addition to British side buffers. The bodies and underframes were built up together as in America, instead of being separate, as is the British practice. A buffet was provided in one of the first-class cars.

With the opening of the G.C.R. extension to London in 1898 came the general introduction of corridor trains, with refreshment services available at any time. The buffet or dining car was of peculiar construction, it had no doors, egress and access being through the vestibule connecting it with the adjoining carriages.

Twentieth-century development of coaching stock has chiefly consisted of increasing the provision of lavatory accommodation, and increasing the number of corridor coaches and corridor trains. Vehicles of greater length are a feature. Third-class carriages with ten compartments are to be found on the G.W.R., S.E. and C.R., &c. The Caledonian Railway, in 1906, introduced third-class bogie coaches 68 ft. long, with 11 compartments seating six aside—a total of 132 passengers per carriage. In 1912 the same company built third-class corridor picnic carriages, with kitchen compartments in which tea is prepared.

In 1915 the G.C.R. introduced a special type of steel buffer beam, &c., known as an anti-telescoping device, and this has proved its value when carriages fitted with the apparatus have been in collision. Steel disc wheels have largely superseded Mansell wheels during the past 12 years on new passenger coaches.

All-steel kitchen cars, weighing 36 tons, were run in the "Flying Scotsman" in the summer of 1914, and about the same time the Metropolitan District Railway introduced all-steel coaches in its electric trains.



BROAD GAUGE COMPOSITE COACH, GREAT WESTERN RAILWAY.

These vehicles (of which there were two, Nos. 386 and 459) consisted of a travelling post office, a guard's compartment, and a third-class compartment.

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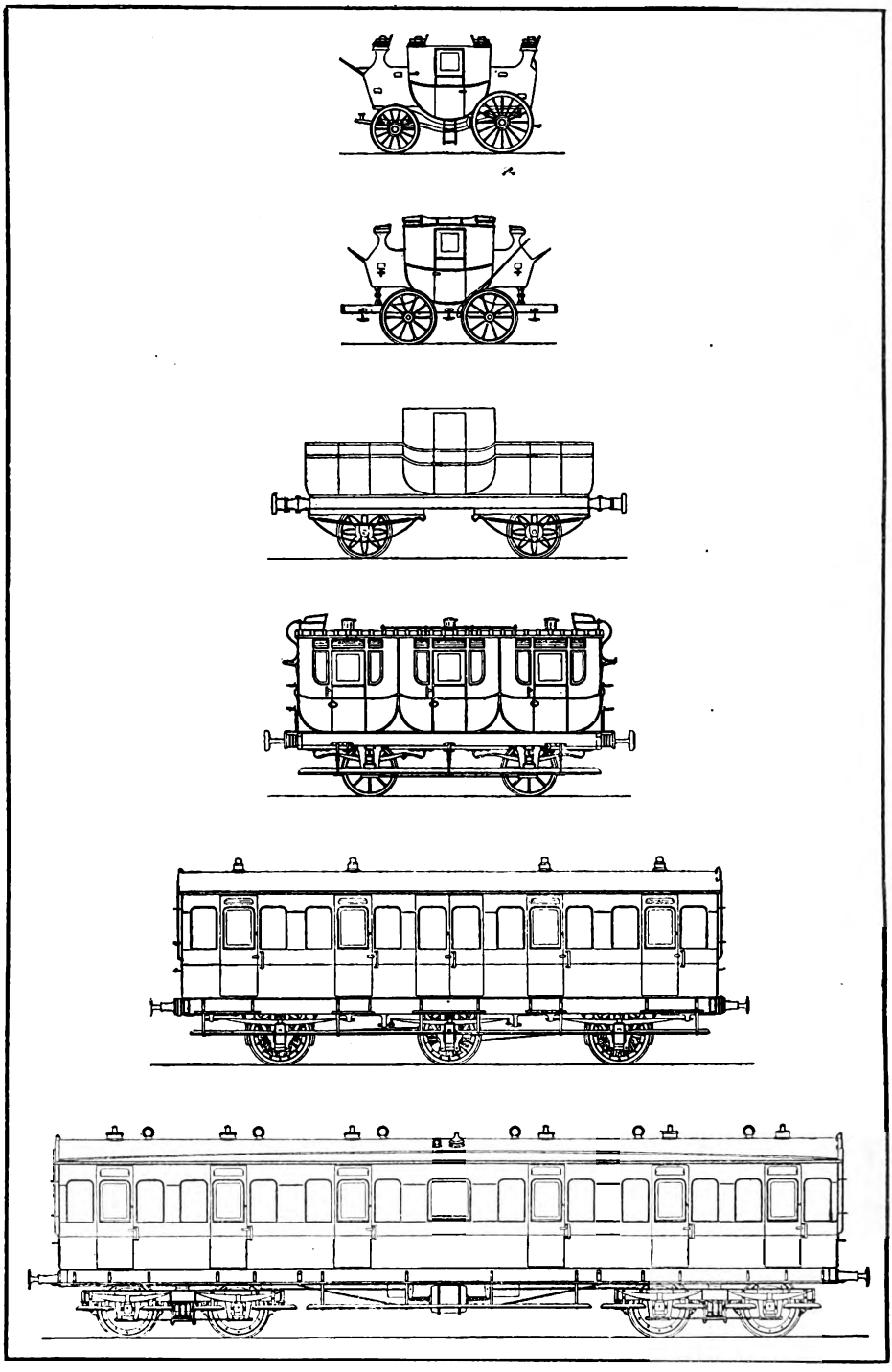

CARRIAGE DEVELOPMENT ON THE LANCASHIRE AND YORKSHIRE RAILWAY.

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About 1913 Mr. Gresley, the Locomotive Superintendent of the G.N. Railway, introduced "twin" coaches, two bodies being carried on three bogies, the centre bogie supporting an end of each of the twins. By 1916 the plan had been further developed, as many as five bodies being supported on seven bogies, and now complete trains are constructed on this plan.

Before completing the survey of coaching-stock development brief reference may be made to the lighting and heating of the vehicles and other improvements adding to the comfort of railway travel.

Practically from the introduction of passenger railways there had been an insistent demand for a means of communication between passengers and guards. The murder of a fellow-passenger by a German on the N.L.R. in 1864 brought the agitation to a head. Various plans were tried, and the Regulation of Railways Act, 1868, made a method of communication compulsory on trains running over 20 miles without stopping. Mostly a cord actuating a bell or whistle on the engine and an indication in the guards van was the apparatus fitted; on some lines the cord was carried outside the carriages. The S.E. Railway and L.B. and S.C. Railway fitted electric systems of communication that proved satisfactory, the former plan indicated by an exterior sign the carriage in which the apparatus had been operated. Several other railways made experiments with electric communication. The efficient system now in use was developed as a consequence of the employment of continuous automatic brakes. It is in fact a partial application of the continuous brake, an indication being displayed outside the coach from which the application is made. Some railways began fitting this so-called method of communication in 1902, and a few years later it had become general in this country.

Lighting of railway carriages was the more urgently required amenity of travel. In the early days tunnels were frequently illuminated by gas, instead of the carriages being provided with lamps. True to the coaching instinct, the "Mails" on some early railways were provided with oil lamps outside, the feeble beams from which made the darkness of the interiors more apparent. Apart from the consideration of cost there was the risk of fire resulting from the accidental upsetting of these vegetable oil lamps. To guard against the risk of fire in 1841 the G.W.R. provided outside lamps for illuminating the interiors of its first-class carriages. It was not till the autumn of 1845 that a commencement was made to light third-class carriages, the Manchester and Birmingham Railway being responsible for the experiment. One lamp frequently served the whole carriage, and when the partitions between the compartments was carried up to the roof, a piece the shape of the lamp was cut out, so that one lamp did duty for the two compartments.

In 1852 the N.E.R. lighted a coach by low-pressure coal gas, and the use of this luminant continued to extend particularly in local London and suburban services that passed through many tunnels. About 1880 the L. and N.W.R. painted the inside of the roofs of carriages with a luminous composition, hoping it would give sufficient light when passing through tunnels in the daytime, but the success was very qualified. About 1890 compressed oil gas, a much better luminant, began to be generally adopted for train lighting. During the years 1881–95 various experiments with electric lighting were made, but they were not generally successful, apart from the efforts of the L.B. and S.C. Railway, which, commencing in October, 1881, with a solitary Pullman lit by electricity, by the end of 1894 had 400 coaches so lighted. Then came an improvement with dynamos worked off the carriage axles, a general introduction of this system set in, but the adoption of incandescent mantles, at first upright and later the inverted pattern, gave compressed oil gas new life as a train luminant. Fires breaking out in train wrecks, said to be fed by gas escaping from the storage cylinders, have caused a reversion to electric lighting on some railways. There are still many gas-lighted vehicles in service, but electric lighting is being rapidly extended and no doubt in time will be practically universal.

The heating of railway carriages in winter by means of pipes conveying steam from the locomotive had been suggested quite early in the railway era, but the footwarmer appears to have been a

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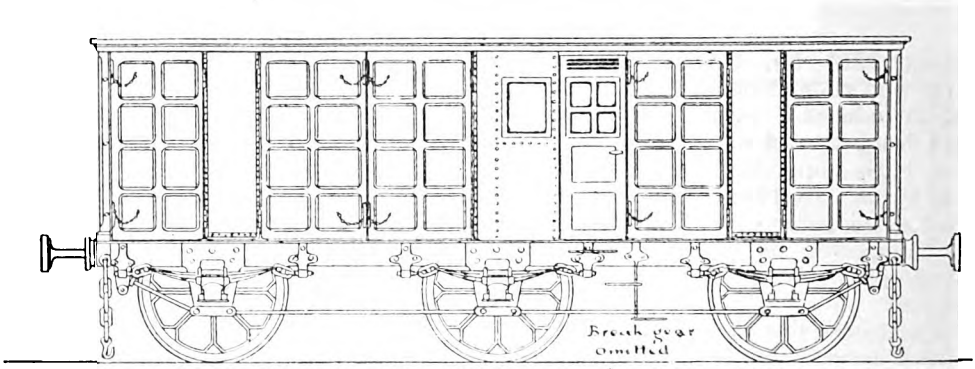

SIX-WHEEL BROAD GAUGE BRAKE VAN OF SIXTY YEARS AGO.

novelty introduced by the G.N.R. in 1852 for first and second class passengers, to gain support for its then new route. Twenty years later (1872) the G.N.R. extended the privilege to third-class travellers, and the other railways followed. The footwarmer remained supreme for many decades, and it is still to be found on branch lines, and even on some main line trains.

Hot-water heating was introduced tentatively on the Midland Railway at the end of 1892, but many years passed before it evolved into steam heating and became general on British railways.

Continuous brakes of various kinds had been tried on different railways since the early "'fifties." In June, 1875, a series of trials of different continuous brakes was held. The Regulation of Railways Act, 1889, made continuous automatic brakes compulsory on passenger trains, and either the vacuum or Westinghouse system was adopted by the various railways.

Dining Cars.

Many of the conveniences on British railways have resulted from the fierce competition between the three routes for the Anglo-Scottish traffic. The introduction of dining-cars was not one of these. Travellers by the Scottish services were allowed by each route 20 minutes at a convenient station, *en route*, to satisfy their appetites, elaborate arrangements for meals being made. To the G.N.R. belongs the kudos of introducing the dining car on our railways. The initial dining car (1st class) was put into service between King's Cross and Leeds in November, 1879.

The Midland followed with Pullman dining saloons between London and Liverpool and Manchester in July, 1882; the L. and N.W. Railway, added first class diners to its Euston-Manchester service on March 1, 1889, and to its Liverpool-London trains a month later. The L. and N.W. Railway saloons were 6-wheel vehicles. The food was mostly cooked before being taken into the car, and merely kept warm there prior to serving.

In 1892 there were provided for both the West Coast and Midland and Glasgow and S.W. routes between England and Scotland sets of twin dining-cars. The West Coast twins comprised a 50-ft. 6-in. combined kitchen and dining car, seating 18, in two compartments, and a dining car which was 47 ft. 9 in. long, contained two saloons, seating 12 and 4 passengers respectively and were provided with lavatories. The longer coach weighed 33½ tons and the shorter 30½ tons, the total length of the twins over buffers was 110 ft. 3 in., each carried on two 6-wheel bogies.

The twin dining cars on the Midland-Glasgow service were provided for passengers to travel in throughout the journey, not merely for the purpose of taking meals as those just described. Each car was 60 ft. over body and 63 ft. 2 in. over buffers, each was carried on two 6-wheel bogies, and weighed about 33 tons. The first class car seated 12 + 9 passengers in two compartments, and was provided with kitchen, pantry and lavatories. The third class car seated 30 + 9 people, and had luggage, lavatory and pantry accommodation; in each car the smaller compartments were for smoking and the larger for meals. They were lighted by compressed oil gas and warmed with hot water circulated from the locomotive.

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In July of 1893 the third class, in addition to existing first class dining accommodation, was provided by the three routes between England and Scotland by the afternoon trains in both directions. The East Coast trains were vestibuled, but only 6-wheel coaches were employed. The East Coast route, not to be surpassed by its competitors in the matter of accommodation for Anglo-Scottish passengers, early in 1895 put in service bogies dining saloons for first class passengers, that apart from Royal carriages were claimed to be the most luxurious railway vehicles in this country. The bodies were 46 ft. long, divided into two saloons.

It was not till May, 1896, that dining cars were provided on the trains of the G.W.R., the 6.10 p.m. Paddington to South Wales being the first train to which a dining car was attached. The vehicles weighed 27¾ tons, and were 56 ft. long. They were for the first class only, of the corridor type, with kitchen, lavatories, &c., and seated 16 passengers ; second and third class dining saloons were added by the L. and N.W. Railway on September 1, 1897, to trains that previously had been provided only with first class dining cars. They had side corridors and were connected by a flexible gangway with the kitchen end of the first class dining car.

The Midland Railway, on January 1, 1897, provided two improved first class dining cars for its London-Manchester service. These cars were 60 ft. long. Not to be outdone by its competitors in the matter of luxurious furnishing and decoration these cars were sent to Gillows, the upholsterers, to be furnished, &c., "regardless of cost."

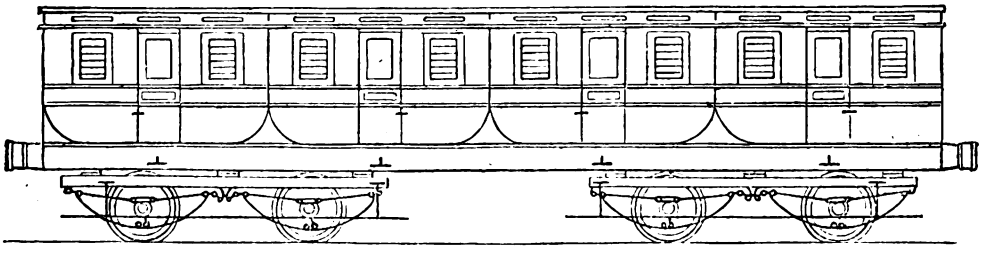
In 1900 the Anglo-Scottish routes provided luncheon cars in the morning trains between England and Scotland. Dining-car services were by this time a firmly-established feature of long-distance railway travel in Great Britain, and within the next decade (1901-10) refreshment cars were added to many services on several railways

Each new dining car is in some way an improvement on its predecessors, such as electricity for cooking in the L.N.E.R., but no striking innovation has to be chronicled during recent years.

Sleeping Cars.

Although the prototype of sleeping saloon (or car) is contemporaneous with the opening of the London and Birmingham Railway in 1838, it was not till 1873 that sleeping saloons were provided.

The L. and B. Railway's "bed carriage" of 1838 was an adaptation of the night mail coach. The end compartment of the mail and the boot were made the "bed carriage." A padded board was placed across the space usually occupied by the legs of the travellers, the back of the compartment next the boot was raised, and two passengers in each mail coach were thus enabled to stretch their bodies across the compartment, place their feet in the boot and rest their head on pillows provided as part of the fittings of the bed carriage. A supplementary charge was made for travelling in the "bed carriage." Prior to the introduction of sleeping cars on the Irish mails between London and Holyhead in March, 1875, first class passengers had been able to recline in a horizontal position by utilising an arrangement of two sticks placed across the space between the two seats of a compartment, and a cushion placed thereon, a passenger by utilising two opposite seats could thus improvise a fairly comfortable bedstead. The guards of the Irish mails made quite



IMPROVED EIGHT-WHEEL "JOINTED" CARRIAGE INTRODUCED ON THE LONDON AND GREENWICH RAILWAY IN 1844.

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a regular practice of loaning the "twin sticks" to passengers for a consideration.

On October 1, 1873, a sleeping car was attached to the night mail between Euston and Glasgow. The coach worked north on Mondays, Wednesdays and Fridays, and left Glasgow on the alternate week-days. The vehicle had three compartments, and each side of a compartment was made into a bed, whilst above each seat a kind of hammock was slung, so that four beds were provided in each compartment. Two compartments (eight berths) were for men, the other compartment being reserved for ladies. A charge of 10s. per berth was levied in addition to the first-class fare. From February 1, 1874, the service became daily in each direction, and an improvement was made in the upper berths, which now was a species of shelf hinged to the partition of the compartment, the berth being turned up flush when not in use.

In 1873 the N.B.R., the northern partner in the East Coast route between England and Scotland, had built by the Ashbury Railway Carriage Company a six-wheel sleeper, 30 ft. long by 6 ft. 8 in. wide. At one end was a luggage compartment and at the other a second-class compartment for servants. A compartment on each side of the central lavatory was first class, convertible to sleeping berths, thus providing six beds. These beds were only 5 ft. 6 in. long, the combined width of the two seats and the intervening passage of the compartment.

The introduction of Pullman cars by the Midland Railway in 1874 at the same time provided sleeping accommodation, the Pullmans being converted at night to "sleepers." These cars had considerable influence in improving the type of "sleepers" by the competitive routes—the G.N.R., for instance, in 1875 introduced Pullman sleeping saloons put together at the Midland Railway Works, Derby.

To meet the Midland "Pullman" competition between London and Liverpool, the L. and N.W. Railway introduced sleeping saloons in the night trains in both directions between London and the Mersey ports on April 1, 1875. New sleepers were introduced in the West Coast Scottish service in 1883; they were carried on eight wheels and were 42 ft. long, and were the first passenger vehicles that exceeded 33 ft. length on the L. and N.W.R. Upper berths were no longer provided. Sleepers henceforth had berths at seat level only, entered from a side corridor and usually had a clerestory roof. Lavatory accommodation was, as a rule, provided in each compartment. Most of the sleepers had both single and double-berth compartments.

First-class travellers by night on the G.W.R. in the early 'nineties of last century were provided with sleeping berths free of charge beyond the ordinary first-class fare in side corridor bogie coaches, 50 ft. long. The vehicles had a peculiar appearance; the berths were transverse, and to obtain the necessary width of coach the sides of the vehicle between the doors were built out, so that the sides had the appearance of bay windows between the doors. There were seven doors on the compartment side of the coach and only three on the corridor side, hence the bay projections were more noticeable on the compartment side. The coaches had seven compartments (14 berths), with a lavatory at each end.

In May, 1896, the G.W.R. introduced a new design in sleepers. Each compartment only had one bed; between each pair of compartments was a w.c., entered through a door on each side. By folding the w.c. doors across the w.c., &c., the latter was enclosed and the two adjoining sleeper compartments became one with two beds. There was only one entrance on each side to the sleeper, through a central door, the sleeping compartments were entered from the corridor. The carriage had eight berths and two sofas, it was 56 ft. long, 8 ft. 6 in. wide, and weighed 26 tons. Like all G.W.R. coaching vehicles at that time the roof had a clerestory. A peculiar feature of the berths was that they were suspended instead of being fixed to the floor. This plan was employed in the expectation that the jolting of the train would not be communicated to the occupants of the berths.

The Midland Railway remained true to Pullman sleepers for some years. In May, 1900, four new ones were put into service between St. Pancras and Glasgow and Edinburgh. They were 60 ft. long carried on six-wheel bogies. They had no

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upper berths, each car had four "state-rooms" with one berth. These occupied half the car; the remainder was a general saloon, with seats for day travel, convertible into berths at night. These Pullmans were built in America, but put together at Derby. At last, however, the Midland Railway built its own sleeping saloons. To show what English railways could do as regards sleeping saloons, the N.E.R. built and exhibited at the Paris Exhibition of 1900 an East Coast sleeper. The vehicle was carried on two six-wheel bogies and weighed 34 tons 18 cwt., but had only nine berths and a smoking compartment with three seats; it was 54 ft. 4 in. long and 9 ft. wide.

In July, 1904, the L. and N.W.R. built for the W.C. joint service sleepers measuring 65½ ft. in length and 9 ft. wide. Eleven berths and a smoking room were provided; six-wheel bogies were employed.

The sleeper service to and from certain places in Scotland was found to be not sufficient to support a sleeping car, so coaches were provided with a few sleeping berths, the remainder of the vehicle consisting of the usual compartments.

At the beginning of 1907 the Highland Railway broke new ground by introducing a sleeping car in the night service between Inverness and Glasgow (Caledonian Railway). The cars were the property of the Pullman Company, the exteriors being polished teak in place of the usual Highland Railway green. The vehicles were 50 ft. long, 9 ft. wide and contained four first-class berths and three third-class compartments (one a coupé).

The L. and S.W.R., having entered into competition with the G.W.R. for the American traffic at Plymouth, in the spring of 1908 built four sleepers, each 56 ft. long by 9 ft. wide with eleven berths. Four-wheel bogies were employed.

In 1914 the L. and N.W.R. built for the W.C. joint service sleeping saloons 68 ft. in length over body and 72 ft. long over buffers, carried on four-wheel bogies. These vehicles weighed 44 tons, the accommodation comprised ten berths and a smoking compartment.

The articulated principle of construction was applied to sleeping saloons by the G.N.R. in 1922 when "twin sleepers" supported on three four-wheel bogies were built for the E.C. joint service. Each sleeper measured 56 ft. 2½ in. long, the total length of the twins, which were connected by a vestibule, was 115½ ft. They provided 20 berths, the total weight of the pair being 62 tons.

Freight Vehicles.

In most cases the early freight vehicles belonged to traders using the railways and not to the companies. Many early railways were constructed chiefly, if not solely, for mineral traffic. The practice of mineral owners supplying wagons for their own traffic has persisted largely to the present time. We pointed out in the section dealing with the coaching stock, the limitations of weight placed by statute upon railway vehicles on many lines, and although these restrictions were removed by Section 16 of the Railway Regulation Act of 1842, there followed no immediate considerable advance in the weight and carrying capacity of goods wagons.

The Liverpool and Manchester Railway, which catered specially for imported cotton, provided wagons for this traffic, which allowed of loads 12 ft. 5 in. high and 8 ft. 3 in. wide being conveyed. Twin timber wagons with bolsters were also supplied, loads up to 50 ft. in length being conveyed. Wagons conveying 4 tons of coal were furnished with three coupling chains. Prints of the period show sheep wagons in two tiers, a type of vehicle long used on the Scottish railways and in the Colonies.

On the London and Birmingham and other early railways, the wagons had cast-iron wheels with wrought-iron tyres. Later wrought-iron wheels were substituted. The cost of a wagon with 18-in. sides was about £65.

The broad gauge rolling-stock of the G.W.R. was of two dimensions—four-wheel and six-wheel. The wheels, 4 ft. in diameter with axle centres 9 ft. 9 in. apart in the case of the four-wheel wagons, protruded through the bottom. The wagons were 8 ft. 1 in. wide at the bottom, the sides slightly over-sailed, the width at top (2 ft. 8 in.) being 8 ft. 3 in. The length of a four-wheel wagon was 17 ft. The drawbars were provided with spiral springs; the buffers were covered with leather. The longitudinal distance

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between buffer heads was 20 ft. 6 in. These wagons weighed about 3 tons 3 cwts., and the six-wheel about 4 tons 12 cwts. Iron wagons soon made their appearance on the G.W.R.

Unlike most early railways, the Newcastle and Carlisle Railway provided coal wagons and let them on hire. They were wider at the top than the bottom, and conveyed an imperial chaldron (53 cwt.). These wagons had inside bearings, but the goods and cattle wagons had outside bearings. The wagons on the Grand Junction Railway measured only 9 ft. 9 in. long, 7 ft. 2½ in. wide and 9¾ in. high, this low side wagon and cattle wagon being the only types at first provided.

Apart from special wagons for unusual traffic and loads of considerable size, for both of which for some years the railways have provided well-designed appropriate trucks, there has been no development of an outstanding character. The size and weight of wagons were gradually increased to a small extent, but until about 25 years ago apart from a slow continuous growth in the size and capacity of goods wagons on British railways, no great advance was made. The first considerable movement towards higher capacity wagons may be said to have commenced with the 20th century. At this date by far the greater proportion of the wagon stock consisted of 5 to 6 and 8-ton open trucks and covered wagons. As late as 1911 the Midland Railway wagon stock consisted chiefly of 8-ton vehicles, about 100,000 of its 120,000 mineral and goods vehicles being of this capacity. They were also chiefly of wood and even now on no British railway, save in the matter of frames, has steel superseded wood to any considerable extent. There was, however, a growing tendency on all railways to increase the carrying capacity of wagons. Within the next few years 10-ton wagons became the standard and 12-ton and 15-ton appeared in fairly large numbers. For locomotive coal traffic 20-ton four-wheel wagons were constructed by the G.E.R. and L. and Y.R.; those on the later line being employed for general traffic when so required; but at the end of 1912 less than 8 per cent. of the total wagon stock of the L. and Y. Railway was over 10 tons capacity.

Largely because of legislation, improvements in the fittings, &c., of goods vehicles have been made, such as either-side brakes, link couplings, spring buffers, &c.

Express goods trains are run at passenger train speeds, and these trains are either composed of vehicles fitted with the continuous brake or "piped" for running in trains with vehicles so fitted. Oil axle-boxes are also fitted, while special springs and couplings are on some railways fitted to such wagons.

When the schedules of rolling-stock required by the Railway Companies (Accounts and Returns) Act, 1911, made their appearance in 1914 (for the year 1913), it became possible to gain exact knowledge of the total of various types of freight rolling-stock. Previously open wagons, whatever their carrying capacity, had been lumped in one total, and similarly covered wagons.

The returns for 1913 required wagons to be distinguished according to carrying capacity. The lowest classification is under 8 tons. The returns for 1913 disclosed the following information:—

	Open.	Closed.	Mineral.
Under 8 *tons*—			
England and Wales	28,019	12,641	2,496
Scotland	725	3,143	1,295
Over 8 tons—			
England and Wales	333,028	62,208	103,569
Scotland	36,120	4,786	78,344

The Schedule of the Act required the information for each class of wagon to be given under eight headings: under 8 tons, 8 to 12 tons, 12 to 20 tons, over 20 tons (other than special). The Board of Trade, however, failed to provide the information required by the Act, and lumped all wagons over 8 tons capacity under one heading. Obviously, there were existing at the date of the return a number of older wagons of 4, 5 and 6 tons capacity on some of the smaller lines, but the number of these small-capacity wagons is not available, as they are included in the total "under 8 tons." Most of the small-capacity vehicles were broken up when the regulations required all wagons to be fitted with spring buffers, as they were fitted with dumb buffers (*i.e.*, merely the prolongation of the sole bars at each end). Taking into consideration the low capacity of such wagons and their age, they were not considered worth the outlay of converting.

The Ministry of Transport Returns for

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1923 are, however, prepared in conformity with the Statutory Schedule, and for Great Britain disclose :—

—	Under 8 tons.	8 to 10 tons.	10 to 12 tons.	12 tons.	12 to 20 tons.	—	20 tons and over, ordinary.	20 tons and over, bogie fitted.
Mineral ..	2,508	42,129	54,122	30,226	29,923	Open Goods ..	1,113	191
Open Goods ..	5,464	109,534	198,341	59,544	1,932	Open Mineral ..	19,353	26
Covered Goods..	9,724	17,313	50,968	9,178	800	Covered Goods..	—	157

In the 11 years it will be seen that the under 8 tons wagons in Great Britain had decreased : mineral by 1,283, open goods by 23,280, and covered goods by 6,070, or a total decrease of small-capacity wagons of 30,623. During the same period the capacity of wagons over 8 tons had increased by 7,075. This decrease was largely due to the call of war services on British wagon stock, and, although no exact deduction can be made from the figures, the big decrease (63·3 per cent.) in under 8 tons wagons, coupled with an increase of 1·14 per cent. of higher-capacity wagons, show that the small-capacity wagon is likely to disappear in the near future. Examination of the returns of separate companies discloses that apparently the 12 and 15-ton wagons are favoured.

Largely as a result of visits to the United States of British railway officers, various railways from time to time endeavoured to introduce larger wagons by adopting bogie vehicles for goods traffic. The introduction of bogie goods wagons was not favoured by the railway technical press. In 1891 the *Railway Engineer*, commenting upon the advantages claimed for bogie wagons, stated, "All these statements have no existence in fact, but are merely illusions emanating from the vivid imaginations of over-cultivated brains."

In 1891 the Belfast and Northern Counties Railway had some 30-ton bogie wagons constructed for conveying iron ore. The bodies were of wood 31 ft. 8 in. long, but bogies were built of Fox's pressed-steel plates. These wagons weighed 10¾ tons.

The Caledonian Railway early in 1899 built bogie wagons to carry 50 tons of iron ore, whilst in 1900 the Furness Railway had similar wagons of pressed steel, capable of carrying 45 tons of ore. The tare of these wagons was only 12¾ tons. About the same time the Furness Railway, for conveying steel rails, introduced 40-ft. bogie trucks with loads up to 40 tons. The tare of these trucks was only 10 tons. The L. and Y. Railway about 1909 introduced bogie goods wagons, the bogies of which were pivoted in a special way so as to support the wagons when one bogie was at right angles to the length. This enabled these big wagons to be transferred by means of the usual turntables in goods sheds.

The N.E.R., strongly influenced in favour of the American bogie-wagon, built or purchased nearly 3,000, but after a few years' trial many had disappeared.

The G.W.R. had a peculiar type of open fish truck carried on two four-wheel bogies. A covered compartment for the guard was provided in the centre of the open truck. The length of the bigger vehicles was 40 ft., width 7 ft. 1 in., height of sides 2 ft. By utilising one of these vehicles on a fish "special," the employment of a brake van weighing about 15 tons was obviated. The trucks were vacuum-fitted, had Mansell wheels, and were therefore available for working in passenger trains.

It cannot be said that great success followed the endeavours to introduce high-capacity wagons on British railways. The fact is that most traffic (except coal, ore, and limestone) on British railways consists of small consignments, and difficulty is experienced in finding full loads for high-capacity vehicles. Many of the high-capacity bogie wagons were actually employed by the owning companies in the conveyance of locomotive coal, although

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it was stated that coal had a deleterious effect upon the metal.

There is always a call for high-capacity trucks for exceptional loads, and the Caledonian Railway, for instance, about 15 years ago had bogie-well trucks capable of carrying 50 tons, whilst the Midland Railway had a truck carried on three four-wheel bogies and with four swivelling points to convey loads of 60 tons.

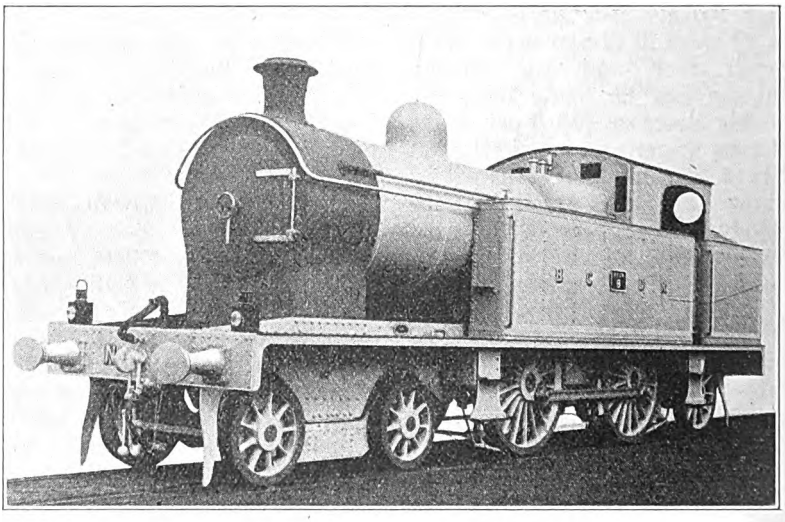
The past 20 years has witnessed a big increase in the provision of wagons for special classes of traffic, such as banana vans, which are steam heated, and refrigerator and insulated vans.

The S.E. and C.R. introduced four-wheel vans for running in passenger trains with an extremely long wheelbase. These vehicles are largely employed for *grande vitesse* and foreign mail traffic, and have a decidedly continental appearance.

In the middle of 1924 the G.W.R. made special efforts to have employed in its South Wales coal traffic metal wagons of 20 tons capacity, the tare being 9 tons 8 cwt.

Traders making use of these wagons were offered rates that were advantageous as compared with those in force for 10 and 12-ton coal wagons.

NEW IRISH LOCOMOTIVES.



THE accompanying illustration shows a new passenger tank engine recently built by Beyer, Peacock & Co. Ltd., Manchester, for the Belfast & County Down Railway. Principal particulars are :—

Cylinders, diam.	18 in.
,, piston stroke ..	26 in.
Wheels, coupled, diam. ..	5 ft. 6 in.
,, bogie, diam. ..	3 ft.
,, radial, diam. ..	4 ft. 2¼ in.
Wheelbase, total	29 ft. 3 in.
Heating surface, firebox ..	117·75 sq. ft.
,, ,, tubes ..	1,257·00 ,,
Total	1,374·75 ,,
Grate area	20 sq. ft.
Working pressure	170 lb. per sq. in.
Weight of engine in working order	66 tons.
Water capacity	2,000 gallons.
Coal capacity	4 tons.

Two of these engines have been constructed, and we are indebted to Mr. J. L. Crosthwait, Locomotive Engineer, Belfast and County Down Railway, for the original from which the illustration has been prepared, and particulars relating to the engine.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

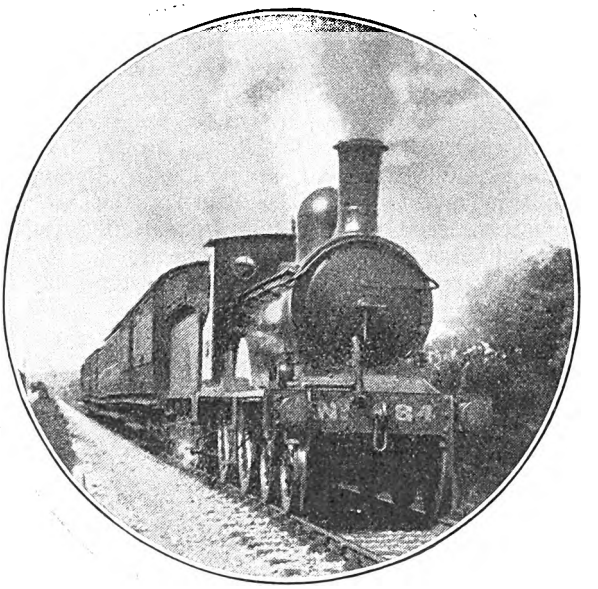

Photo.] [*W. Leslie Good.*

ABERYSTWYTH EXPRESS, G.W.R.

Cambrian 4-4-0 locomotive No. 84.

BY the time that this article is in print the most interesting event in British locomotive annals, for many decades, will have passed into history. As I foreshadowed in these articles as far back as December last, the competition between *Flying Fox* and *Pendennis Castle* could hardly fail to take place, after the claims and counter-claims which had been made on behalf of the respective types. Unfortunately, the date finally decided on for tests left it just too late for me to include details of the running of both engines in my present article; nothing could, indeed, have better carried on the theoretical discussions as to the relative merits of the Gresley "Pacifics" and the Collett "Castles" than a description of their performances over each other's routes. That, however, must be reserved for next month, by which time I hope to have been present personally during 1,080 miles of the test runs, and also to supplement these details with the logs of experienced correspondents on certain other of the trial trips.

Meanwhile, by way of contrast, I want to deal with locomotive work over a line on which reliance is placed on nothing larger than 4-4-0 engines for express haulage. From time to time I have promised a description of running over the Midland West of England main line of the L M S, but for one reason or another the runs have always been crowded out when the point has at last been reached of dealing with them. Recently, however, I have received a letter from a close friend and correspondent, who has condensed his extensive experience of West of England performance into a summary of such unusual interest as to demand the devotion of the remainder of this article to its consideration. He shall tell the story in his own language.

"The standard of running on the West of England main line is on the whole moderate, and this is due, paradoxically, to its easy grading. British drivers are traditionally disposed to nurse their engines, which, up to a reasonable limit, is a good point. On the Midland this tradition has developed into the practice of running easily on all but the severe climbs with which the main line abounds. The West of England line, however, has but few steep banks, and the engines are therefore nearly always worked on the first regulator valve. As a matter of fact, to drive the superheater simple 4-4-0's of Classes 2 and 3, which are the engines chiefly used over this route, with the second regulator valve consistently would involve a much greater strain than on the London road, since there the drivers have frequent opportunities of shutting off

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steam or running under easy conditions."

I might explain here, by way of parenthesis, that the practice is followed on the Midland of fitting the engines with a small jockey-valve on the back of the regulator, as on the Great Western Railway, which is the "first regulator valve" referred to by my correspondent, the "second regulator valve" being the main opening.

"In the course of several years of regular travel over the West of England line, however, I have enjoyed a number of really noteworthy journeys. The selection embodied in the accompanying tables is of value, as it includes the work of each of the four classes of Midland express engines, and with loads ranging from 130 to 370 tons.

"My remarks concerning the standard of running apply especially to the first stage of the south-bound journey, from Derby to Birmingham. The tendency of the road is distinctly against the engine, but only at grades such as 385 to 500, with a fair proportion of level. Run 1 is very characteristic of the work performed on the 12.35 p.m. express, which is always worked by a Class 2 superheater rebuilt 4-4-0, stationed at Gloucester. This train shares with the 4.40 p.m. the crack 51-minute timing of the day. This should not be difficult of achievement, but, as will be seen, time was lost, to the apparent unconcern of the driver. Between Derby and Burton speed reached 53½ m.p.h. on the level, and after slacking to 44, as enjoined at Burton, we did not exceed 50 till passing Tamworth, and 55½ on the mile or so of down grade past Kingsbury. Out of 30 journeys on this train we have only exceeded 60 m.p.h. five times, and on three of these occasions we were piloted. On the second run, No. 520 lost more time with a slightly heavier load. We reached 52 at Repton, and then, after passing Wichnor at 50, fell to 44 at Tamworth and 40 at Kingsbury, although out of these 13 miles only 2 are as steep as 1 in 408. The couple of miles down at 1 in 460 past Kingsbury produced a maximum of 47 and speed then dwindled away as we approached Birmingham. I have had several similar runs.

"The next two runs are very different in character. The 4.40 p.m. train is worked by Derby drivers with Class 3 locomotives, and more recently with compound engines, and while time is not

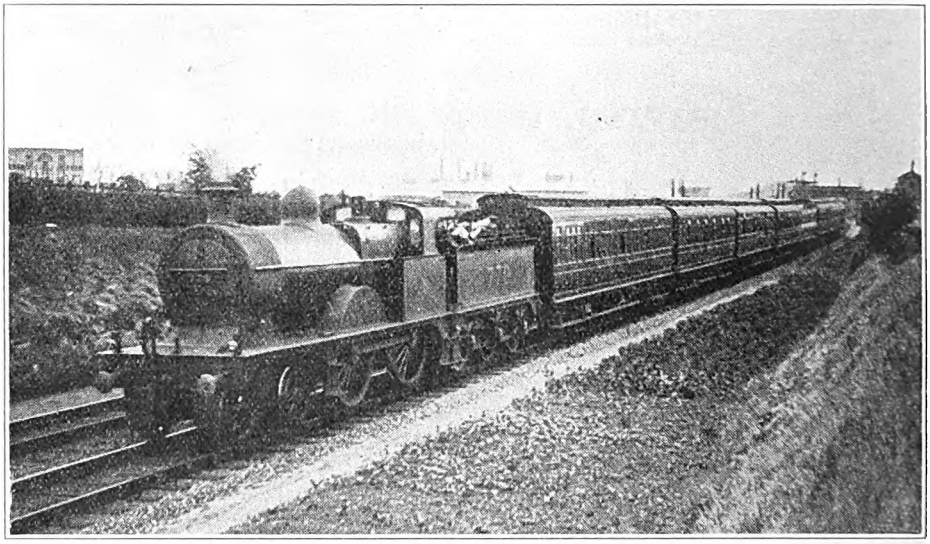

Photo.] [*H. L. Salmon.*

DERBY-BRISTOL RESTAURANT CAR EXPRESS NEAR DERBY, L.M.S.R.

Midland Division 4-4-0 locomotive No. 779, class 3.

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always kept, the running is generally a little more spirited. Nos. 773 and 1057 were both driven by W. E. Poole, one of the best-known Midland drivers at Derby, who may always be relied on to do his utmost to effect a punctual arrival. No. 773 had the heaviest load of all, and, as so frequently happens to this train, was cruelly delayed. The first delay was a dead stand for signals no further from Derby than Osmaston Road Box, but on restarting a speed of 61 m.p.h. was reached at Repton, and increased to 64½ before Burton. Brakes were then applied for signals and we ran right through Burton at 30 m.p.h. Getting away magnificently from the slack, however, we sustained 57 up the rising grades past Wichnor and fluctuated between 55 and 58 onwards to Wilnecote, after which speed rose to 62 at Kingsbury and 65 at the bridge over the river Tame. This was immediately followed by another signal check to 23 m.p.h. at Water Orton, and though we accelerated rapidly to 54 at Bromford Bridge the final approach to Birmingham was very badly delayed.

"The fourth trip was made during the first week that a compound worked this train. No. 1057 had the lightest load of the series, but the running was very novel over this road. Instead of barely touching 60 m.p.h., as is usually the case, we barely went below that speed, save for the slack at Burton. As usual, the start was behind time, and an unusually rapid acceleration only preceded a dead stand at Pear Tree, while a local from Melbourne crossed our path. Getting away rapidly again, we sustained 61 an hour to Burton. After slacking to 45 through the station, exceptional running followed, for at Wichnor we were travelling at 65 m.p.h. on a rising grade of 1 in 500. Speed did not fall below 60 on the 1 in 400 towards Tamworth, but through easing of the engine we dropped for a moment to 59 near Wilnecote. After that the maximum was 64 at the bridge over the Tame, and we were still doing 60 at Water Orton. A slight signal check occurred at Washwood Heath, but our overall time was still well within schedule.

"In the reverse direction the two runs

TABLE A.—L.M.S. DERBY TO BIRMINGHAM.

Miles.	Engine No.	Schedule.	466	520	773	1057	Schedule.	420	520	Miles.
	,, Class ..		2	2	3	4		2	2	
	Load tons (tare) ..		215	232	252	184		215	167	
	,, (full) ..		230	255	275	200		230	185	
		min.	m. s.	m. s.	m. s.	m. s.	min.	m. s.	m. s.	
0·0	Derby	0	0 00	0 00	*a* 0 00	0 00	48	47 00	44 00	41·2
1·4	Pear Tree	—	3 55	3 30	2 55	*e* 4 00	—	44 15	41 50	39·8
6·3	Repton	—	10 20	10 15	9·05	11 15	—	38 35	36 35	34·9
					b					
11·0	Burton†	14	15 50	16 00	14 25	16 00	35	32 30	31 05	30·2
12·6	Branston	—	18 00	18 20	16 45	18 00	—	30 45	29 35	28·6
16·5	Wichnor Jc. ..	20	22 40	23 25	21 15	21 40	29	26 45	26 00	24·7
19·6	Elford	—	26 40	27 00	24 35	24 55	—	23 45	23 15	21·6
23·9	Tamworth	29	31 55	32 20	29 05	29 05	21	19 30	19 10	17·3
29·4	Kingsbury	36	38·20	40 10	34 50	34 45	16	13 50	13 45	11·8
					c					
33·5	Water Orton ..	40	43 05	45 25	39 40	38 50	12	9 55	9 50	7·5
35·9	Castle Bromwich ..	—	46 00	48 35	43 30	41 20	—	7 40	7 30	5·3
						f				
39·1	Saltley	46	49 40	52 40	47 10	44 45	6	4 15	4 00	2·1
					d					
41·2	Birmingham ..	51	53 10	56 30	54 15	49 15	0	0 00	0 00	0·0
41·2	Net times (min.) ..	51	53	56½	48¼	47¾	48	47	44	41·2

† Service slack. (*a*) Start from Osmaston Road signal box. (*b*) Signals to 30 m.p.h. (*c*) Signals to 23 m.p.h. (*d*) Signals, dead stand, Proof House. (*e*) Signal stop Pear Tree, departure time. (*f*) Signal check.

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were on the 3·6 p.m. out of New Street—the train with the through Leeds-Torquay coaches corresponding to the 12.35 p.m. ex-Derby. The first run is a typical one. Speeds were 62 m.p.h. at Castle Bromwich; 65 at the bridge over the Tame, with a subsequent minimum of 57 past Kingsbury; 60½ at Tamworth, eased to 57 over the troughs; then 61-62 all the way to Burton, and afterwards not much above 50. No. 520's effort, however, was exceptional, though obviously over this road such times are easy of achievement. At Castle Bromwich we had reached 60 and attained 66 prior to a minimum of 60 past Kingsbury. We then passed Tamworth at 63, Elford at 67, Wichnor at 69, and Barton at 70. We negotiated Burton station at 50 and afterwards touched 58, gaining exactly 5 min. on the 49-min. schedule.

"South of Birmingham the running is much more interesting. The immediate start out of New Street is an exceedingly difficult one, being on a rising grade of 1 in 80, sharply curved and through damp tunnels. After passing Five Ways, the line continues to ascend at 1 in 290-301, with short breaks at Church Road, Bourneville and beyond Halesowen Junction. There is, however, a full mile at 1 in 132 past King's Norton, with the additional complication of a severe curve and junction where a speed restriction is in force. This, of course, affects north-bound trains, but rarely necessitates appreciable easing of south-bound trains. In these circumstances the booking of 17 minutes to the regulation stop at Blackwell which precedes the descent of Lickey incline, is a 'counsel of perfection,' and personally I have never yet seen it observed. No. 773 would certainly have kept time had she had the assistance of a banking engine to Church Road, as is often afforded, or even but for severe slipping through the tunnels due to an obstruction in one of the sanding pipes.

Photo.] LEEDS-BRISTOL EXPRESS, L.M.S.R. [*W. L. Good.*

Midland Division 4-4-0 locomotive No. 768 (class 3), fitted with Weir feed-water heater and pump.

"The first two runs in Table B are continuations of the first runs described and show further losses of time. The first is a typical unpiloted run on the Torquay train. We were banked to Church Road by a 0-4-4 tank engine, but were stopped there by signal for 3 min. We then touched 49 at Bourneville and fell to 42 at King's Norton. After descending the Lickey with the customary caution and slacking through Bromsgrove, we touched 65½ m.p.h. on the 1 in 283-327 to Droitwich Road, fell to 55½ on the level past Dunhampstead to Spetchley,

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and could only reach 61½ on the further five or six miles at 1 in 301-385 to Defford. The brief 1 in 319 up to Bredon reduced speed to 53 and the three miles at 1 in 300 down to Ashchurch raised it to 59. The remainder of the distance to Cheltenham rises at 1 in 295-305 and on this we fell to 44 before shutting off; we had thus dropped a further 2½ min. No. 520 was also banked from the start—quite vigorously by a 0-6-0 goods engine—but only reached 46 at Bourneville. We touched 67 an hour at Droitwich Road, ran at 58-61 across the level to Spetchley and reached 65 at Defford. Thereafter, however, we dropped to 51 at Bredon and 38½ beyond Cleeve, with a maximum of 57½ at Ashchurch.

"But if these runs were depressing, that of No. 773, under the *ægis* of Driver Poole, was really exhilarating. As I have mentioned, we had no banking assistance at the start, despite the load being in excess of the special limit allowed, and the defect in the sanding gear, which was a further handicap. But once through Five Ways we went ahead wonderfully. We had accelerated to 46½ m.p.h. at Selly Oak, and this speed increased exceedingly rapidly to 56 at Bourneville. The awkward rise past King's Norton did not bring us below 51 an hour, and we subsequently accelerated to 53½ up the 1 in 300 past Northfield, while the very brief dip beyond the tunnel raised the speed to 58. This rate was sustained up the further 1 in 290 grade past Barnt Green till steam was shut off for Blackwell stop. After restarting and descending Lickey with due caution, Driver Poole opened the regulator well on to the second valve, and we did some very fast travelling on to Cheltenham.

"Speed reached 70½ m.p.h. at Droitwich Road, and was maintained at 67 across the level to Spetchley. Abbott's Wood Junction was passed at 70 and speed then rose gradually to 73½ at Defford, the average rate for these 4·8 miles being 72 m.p.h. Very little more than half this distance is as steep as 1 in 301, the remainder being at 1 in 385, with half a

TABLE B.—L.M.S. BIRMINGHAM TO CHELTENHAM AND GLOUCESTER.

Miles.	Engine No. .. .. / ,, Class .. / Load tons (tare) .. / ,, (full) ..	Schedule.	466 / 2 / 215 / 230	520 / 2 / 232 / 255	773 / 3 / 252 / 275	1057 / 4 / 184 / 200	420† / 2 / 240 / 260	Schedule.	525 / 2 / 190 / 205	522 / 2 / 215 / 230
		min.	m. s.	m. s.	m. s.	m. s.	m. s.	min.	m. s.	m. s.
0·0	Birmingham ..	0	0 00	0 00	0 00	0 00	0 00	0	0 00	0 00
0·9	Five Ways	—	3 45	3 05	4 05	3 50	3 10	—	3 30	3 50
3·3	Selly Oak	7	13 30 *a*	7 30	8 15	8 15	7 20	8	7 35	8 25
5·5	King's Norton ..	—	16 25	10 45	10 50	10 40	*c*	—	10 30	11 15
10·5	Barnt Green ..	—	23 20	18 20	16 30	16 35	*c*	—	17 15	17 55
12·0	Blackwell§	17	25 10	20 20	18 15	18 20	23 35	18	19 05	19 40
14·2	Bromsgrove	22	28 45	23 55	21 55	22 00	27 15	23	22 35	23 25
20·9	Dunhampstead ..	29	35 25	30 40	28 20	28 50	33 50	30	29 15	30 10
25·0	Spetchley	—	39 45	34 50	32 00	32 40	37 20	—	33 05	33 50
27·5	Abbott's Wood Jc. ..	—	42 20	37 25	34 20	35 00	39 25	—	35 25	34 05
32·3	Defford	—	47 05	42 10	38 20	39 20	43 15	—	39 35	40 05
36·1	Bredon	—	51 10	46 00	41 40	42 55	46 30	—	42 55	43 20
38·2	Ashchurch	46	53 25	48 25	43 40	45 00	48 25	47	44 55	45 15
41·7	Cleeve	—	57 25	52 20	47 00	48 35	51 35	—	48 15	48 30
45·5	Cheltenham	55	62 30	58 15	51 40	53 40	56 15	—	52 30	52 45
48·7	Churchdown ..	—	—	—	—	—	—	—	56 00	56 35
52·0	Gloucester	—	—	—	—	—	—	63	*b* 61 15	60 40
45·5	Net times (min.) ..	55	57½	58¼	51¾	53¾	52¾	*63	*60	*60¾

† Piloted by No. 505. (*a*) Signals dead stand, Church Road, 3 min. § Trains stop momentarily to test brakes. (*b*) Signal check. (*c*) Signals King's Norton and Halesowen Jc. * To Gloucester, 52·0 miles.

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mile of level. The rise to Bredon did not bring us below 66½, while at Ashchurch we were again travelling at 69. At Cleeve, after 3½ miles rising, mostly at 1 in 295, we were still running at 58½ m.p.h., and the minimum before shutting off steam for Cheltenham was well over 50. Thus we regained 3¼ minutes of lost time with the heaviest load in the table, well over the unpiloted limit of 220 tons allowed this type of engine, and the run was a fine performance. Indeed, considering also the first stage of the journey from Derby, so sustained an effort represented much harder running than is customary on the London road." Assuming that a halt of, say, 10 sec. was made at Blackwell, the start-to-stop time over the 33·5 miles from there to Cheltenham must have been 33¼ min., or under "even time."

"By comparison, No. 1057, on the same train, had an easy task, and the contrast in working of the engines was most marked. Whereas No. 773 had awakened the echoes for miles around the Birmingham suburbs, the compound took things most placidly, and, I have no doubt, burned a good deal less fuel. Speed was slightly lower than on the preceding journey, except at Selly Oak and Bourneville, passed in this case at 51 and 58 m.p.h., respectively, and 1¼ min. were cut from schedule with ease.

"The next run was on the Torquay train again and was piloted, as is usual during the summer. It is included, however, as the running south of Bromsgrove was the fastest I have ever experienced. We suffered early signal delays which made us 6¼ min. late at Blackwell. After regaining 1¼ of these on the generous allowance down the incline, the two engines, both superheated Class 2 4-4-0's, made merry. Speed rose with great rapidity to 72 at Droitwich Road (it should be remembered that Bromsgrove is seldom passed at more than 35 to 40 m.p.h.) and we never went below 71 across the subsequent level. Abbott's Wood Junction was passed at 76, and Defford at no less than 78 m.p.h., my record on the West of England main line. The rate at Bredon was 67, at Ashchurch 70, at Cleeve 62, and we were travelling at a sustained 56 prior to shutting off for Cheltenham." The average speed over the 27·5 miles from Bromsgrove to Cleeve works out at all but 68 m.p.h. Such striking cross-country efforts would be recorded nowhere else in the world than in Great Britain.

"The other two runs were on the afternoon Lincoln-Bournemouth train leaving

Photo.] DOWN BRISTOL EXPRESS, L.M.S.R. [*W. L. Good.*

Midland Division 4-4-0 locomotive No. 523 (class 2, rebuilt and superheated).

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New Street at 1.55 p.m., on which the work is nearly always superior to that performed on the Torquay train in front, although the schedule is slightly easier. Indeed, though the latter is due away half an hour earlier from Birmingham, we usually ran into its signals approaching Gloucester." In this connection it is only fair to add that most of my correspondent's southbound runs were made on Saturdays, when there is more liability to delays.

"No. 525 had the assistance of a banker on starting, subsequently touching 49 m.p.h. at Bourneville and falling to 43 on the ensuing rise. We went excellently below Bromsgrove, however, attaining 68 m.p.h. at Droitwich Road, falling to 64 on the subsequent level, and regaining 68 on the 1 in 323 beyond. The brief level across Abbott's Wood Junction brought us down to 65 again, but at Defford the speed rose to 73, and the minimum at Bredon was 65. After touching 68 at Ashchurch, we fell to 52 prior to slacking to 45 through Cheltenham. On the succeeding fall at 1 in 304-368 to Gloucester, we regained 65 m.p.h., but were then delayed by the Torquay train, which was still standing at Gloucester platform. Otherwise the time to Gloucester would not have exceeded the even hour—3 min. under schedule.

"No. 522 did even better with an extra corridor bogie. No banking assistance was provided, but 51 m.p.h. was reached at Bourneville and the minimum beyond Halesowen Junction was 44. We reached 70 an hour at Droitwich Road, fell to 65½ on the tiny rise at Dunhampstead, but then sustained a good 68 miles an hour on to Spetchley—excellent work for a Class 2 4-4-0. The sustained speed on the easy down grades was 72 m.p.h. with a brief fall to 68 over the junction and a final maximum of 73½ in the river valley at Defford. We fell to 65½ an hour at Bredon, regained 72 at Ashchurch and after a fall to 53 slackened to 44 through Cheltenham. The subsequent speed was sustained at 60 m.p.h. This was quite a speedy run, even if it did not quite deserve the remark of a fellow passenger, who at Defford declared that the train was just as fast as the 'Cornish Riviera Limited.'

"It is rather a 'grind' in the reverse direction, and the best timing

TABLE C.—L.M.S. CHELTENHAM TO BIRMINGHAM.

Miles.	Engine No. ..	Schedule.	505	510	Schedule.	431*	761	1067†	Schedule.	506	521
	,, Class ..		2	2		2	3	4		2	2
	Load tons (tare)		205	132		240	285	370		218	225
	,, (full) ..		220	145		260	305	395		233	245
			m. s.	m. s.		m. s.	m. s.	m. s.		m. s.	m. s.
0·0	Cheltenham ..	0	0 00	0 00	0	0 00	0 00	0 00	0	0 00	0 00
3·8	Cleeve	—	5 35	5 10	—	6 05	6 05	5 40	—	5 50	5 45
7·2	Ashchurch ..	10	9 15	8 30	9	9 30	9 35	8 55	8	9 05	9 00
		0	0 00	0 00							
9·4	Bredon	—	4 15	3 55	—	11 50	11 50	11 00	—	11 15	11 05
13·2	Defford	—	8 25	7 45	—	15 35	15 55	14 35	—	14 55	14 40
18·0	Abbott's Wood ..	15	13 25	12 35	23	21 15	21 30	19 45	22	20 00	19 40
20·4	Spetchley ..	—	15 55	15 10	—	24 05	24 30	22 35	—	23 00	22 30
24·6	Dunhampstead ..	22	20 15	19 35	31	28 45	29 20	27 05	29	27 25	26 40
31·3	Bromsgrove ..	30	28 25	27 50	40	36 45	37 50	34 50	37	35 10	34 25
0·0		0	0 00	0 00	0	0 00	0 00	0 00	0	0 00	0 00
2·2	Blackwell ..	7	7 10	7 15	7	7 40	7 30	9 00	7	6 50	7 20
3·6	Barnt Green ..	—	9 45	10 20	—	10 20	10 05	11 40	—	9 20	10 00
8·7	King's Norton ..	—	15 00	a 17 15	—	16 20	16 25	17 15	—	14 50	15 55
10·9	Selly Oak ..	17	17 40	20 20b	18	20 00	19 45	20 15	17	17 40	18 40
14·2	Birmingham ..	23	22 45	c 27 10	24	25 15	25 55	25 35	23	22 15	23 50

* Unrebuilt. † Piloted by No. 672. (*a*) Signal check. (*b*) Signals dead stand. (*c*) Signal check.

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of 61 minutes from Cheltenham to Birmingham leaves little to spare when allowance is made for the stop at Bromsgrove to attach a 'banker.' King's Norton slack prevents any high speed being run into Birmingham. The first two runs in the table were on the 7.40 a.m. from Bristol. No. 505, with a load rather heavier than usual, made one of the best runs I have had on this train, though curiously enough the very first out of 21 trips. We ran smartly to Ashchurch down the 1 in 295, with a maximum of 66 m.p.h. Up the 1 in 310 to Bredon we accelerated to 47, reached 41½ at we made our climb in about the seven minutes allowed, and then reached 65½ m.p.h. at Barnt Green. The slack was to 40 an hour at King's Norton, and we reached 56½ m.p.h. at Somerset Road, a somewhat thrilling rate over this last winding stretch.

"The next run was equally unusual in loading, this time in its lightness. But I include the run because, despite the traditional effects of Monday morning, the driver was enterprising to a degree. We had run the 6·5 miles from Gloucester to Cheltenham, entirely uphill, at the usual grades of about 1 in 300, in 9 min. 25 sec.

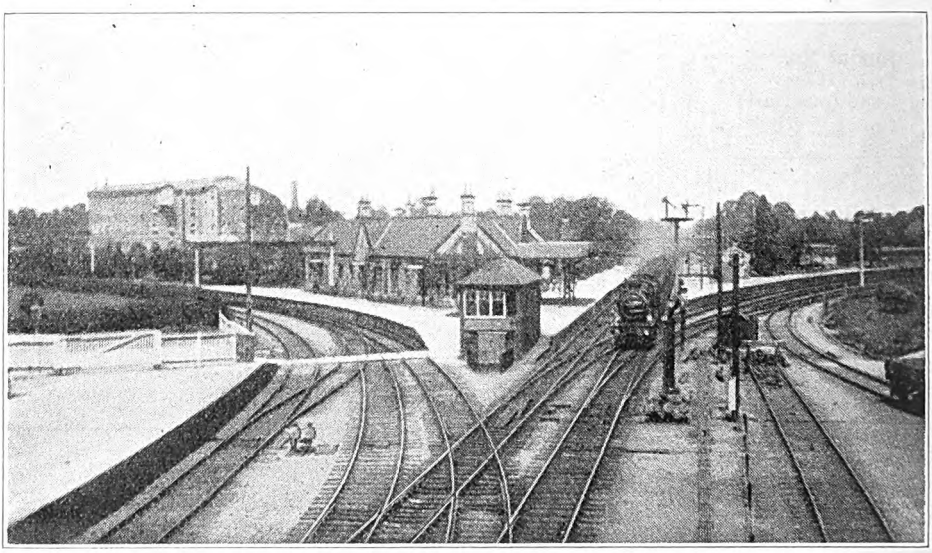

Photo.] [*H. McL. Havergal.*

ASHCHURCH JUNCTION, MIDLAND DIVISION, L.M.S.R., LOOKING NORTH.

Main line in centre, and branches to Malvern and Redditch on left and right respectively.

Defford and did not fall below 56 at Abbott's Wood nor 57 at Spetchley with a brief rise to 60 just after crossing the junction. This was excellent climbing, even though the grade is not steeper than 1 in 301. Afterwards we sustained 60 along the level. At the time this run was made there was a passenger stop at Bromsgrove, cancelled in the second case. But as the stops in Bromsgrove yard vary in duration (we once waited there for nine minutes for a banker, after having hurried specially to make up lost time!) I have restarted the times from zero in every case. Restarting, then, with the assistance of the mighty No. 2290, start-to-stop, with a maximum speed of 56 m.p.h. Then we made an astonishing spurt to Ashchurch, with a maximum of 74 m.p.h.! A time of 8 min. 30 sec. for a run of 7·2 miles, start-to-stop, must indeed be something of a record. Restarting, the engine took things rather more quietly, but still reached 48 m.p.h. at Bredon, 64 at Defford, fell only to 56 at Abbott's Wood, and subsequently sustained 60 up the rising grades. Gathering speed again on the level, we were checked to 37 m.p.h. by Dunhampstead distant signal, but, accelerating again with great rapidity, still beat No. 505's time to Bromsgrove. We had the assistance

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of a 0-6-0 tank engine up Lickey, but after reaching 67½ m.p.h. at Northfield were delayed very badly by signals.

"Then follow three runs on the Mail, which leaves Bristol at 7.20 p.m. for the North of England and Scotland. This is always a heavy train, but is liberally timed. No. 431, one of the original saturated 4-4-0's with round-topped firebox, had, however, no light task with 260 tons. We did magnificently, with speeds of 64 at Ashchurch, 59 at Defford and nothing below 50½ at Abbott's Wood Junction, subsequently reaching 57 beyond Dunhampstead. No. 2290 again assisted us up the Lickey, and we went easily afterwards.

"No. 761 (Class 3) took the heaviest unpiloted load of all the runs, but did well. Speed was again 64 m.p.h. at Ashchurch, 53½ at Bredon, 59 at Defford, 47½ at Abbott's Wood Junction, and 56 beyond Dunhampstead. The compound run, which is very recent, was, as one might expect, much the best. The pilot, an old 'single,' could not have accounted for more than 100 tons, but we were doing 69 m.p.h. at Ashchurch, 61½ at Brendon, 66 at Defford, nothing below 53 up the 1 in 301 and a sustained 59 subsequently. But then witness the phenomenon of *three* engines, including the most powerful machine in England, the ten-coupled banker No. 2290, *losing* 2 mins. between them up the 1 in 37·7 of Lickey with less than 400 tons! The Midland system of multiple engine working is seen in *excelsis* on the Lickey incline. Piloted trains often take two tank engines to push, when No. 2290 is not available, and the passenger thus receives his momentum from the joint services of *four* locomotives at once! On this occasion I fancy the fireman of No. 672 was pricking his fire, and filling his boiler, what time the engine considered its function as a hauling agent temporarily abrogated.

"The last two trips were on the 'crack' 61-min. timing, and were sound locomotive performances. No. 506 passed Ashchurch at 66 m.p.h., Bredon at 59, Defford at 64, Abbott's Wood at 51, and Dunhampstead at 58. We were banked by two 0-6-0 tanks and made quite a smart ascent of Lickey, subsequently touching 63 m.p.h.

TABLE D.—L.M.S. GLOUCESTER TO BRISTOL.

Miles.	Engine No. .. .. / ,, Class .. .. / Load tons (tare) .. / ,, ,, (full) ..	Schedule.	662 / 1 / 137 / 150	519 / 2 / 225 / 240	450† / 2 / 240 / 260	Schedule.	505 / 2 / 205 / 220	510 / 2 / 132 / 145	531 / 2 / 236 / 250	Miles.
			m. s.	m. s.	m. s.		m. s.	m. s.	m. s.	
0·0	Gloucester	0	0 00	0 00	0 00	19	17 55	16 50	36 15	14·9
			a							
5·6	Haresfield	—	10 15	9 20	8 15	—	11 40	11 25	30 15	9·3
6·9	Standish Junction ..	11	12 05	11 15	9 45	10	10 10	10 00	28 45	8·0
8·6	Stonehouse	—	13 55	13 10	11 20	—	8 25	8 10	26 50	6·3
10·4	Frocester	—	15 45	15 00	12 55	—	6 35	6 20	25 00	4·5
12·5	Coaley Junction ..	—	17 50	17 20	14 45	—	4 10	4 00	22 55	2·4
						0	0 00	0 00		0·0
14·9	Berkeley Road ..	19	20 15	20 00	16 55	22	18 45	18 25	20 35	17·0
20·1	Charfield	—	25 45	26 10	21 45	—	13 35	13 40	15 55	11·8
22·0	Wickwar	—	28 05	28 40	23 45	—	12 10	12 00	14 10	9·9
26·7	Yate	—	34 10	34 55	28 45	—	7 25	7 35	9 05	5·2
						0	0 00	0 00	0 00	0·0
31·9	Mangotsfield	38	40 05	41 00	34 15	13	—	*10 50	12 00	5·1
34·0	Fishponds	—	42 40	43 35	35 55	—	—	* 7 25	8 05	3·0
					(*b*)					
37·0	Bristol	48	sigs.	47 50	44 20	0	—	* 0 00	0 00	0·0
37·0	Net times (min.) ..	48	45½	47¾	40¼	—	—	—	—	—

* No. 438 with 170–185 tons. † Piloted by No. 526. (*a*) Signals to 31 m.p.h. (*b*) Signals dead stand.

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at Northfield and 57½ at Somerset Road, with an intermediate slack to 41 at King's Norton The finish was exceedingly smart, and as a result the engine made my record overall north-bound time—57 mins. 50 secs., including Bromsgrove stop. No. 521 did even better with a substantial load. Speeds were 68 an hour at Ashchurch, 60 at Bredon, 67 at Defford, 51 at Abbott's Wood, and 62 on the level. No. 2290 officiated in rear, and after negotiating Lickey we ran easily onwards. This was one of the best runs I have had on the West of England line.

"Between Gloucester and Bristol the grades are slightly harder, especially at the extremities of the journey; but good times are often made. The first run in the table is of special interest as it displays the work of one of the old single-drivers, called on during last summer for one or two Saturdays, in order to work the relief to the Torquay train. The light tare weight was due chiefly to the somewhat ancient stock of which it was composed.

"The start from Gloucester is for a mile up 1 in 108. After a couple of miles' 'breathing space' a further similar stretch at 1 in 104 occurs, followed by a length of 1 in 300 up to Haresfield station. The single had accelerated to 51 when the signal check occurred, but at Haresfield we reached 42 again. From Haresfield to Coaley Junction the trend is downward at 1 in 239–366, and on this we reached 61½ at Stonehouse and 64 at Coaley, with a brief fall to 58 on the rise past Frocester. From Coaley the line undulates to near Charfield; then follows a long ascent at 1 in 281 to the tunnel beyond Wickwar. At Berkeley Road we were doing 60 m.p.h., and our final minimum was 46. The mile-a-minute rate was again reached on the slight fall and level on to Mangotsfield. From Fishponds to Lawrence Hill Junction at Bristol is a steep descent at 1 in 63–88, on which we reached 66 prior to being checked by signal. There is a service slack through Mangotsfield. The net time made by this veteran was thus 2½ min. less than that scheduled.

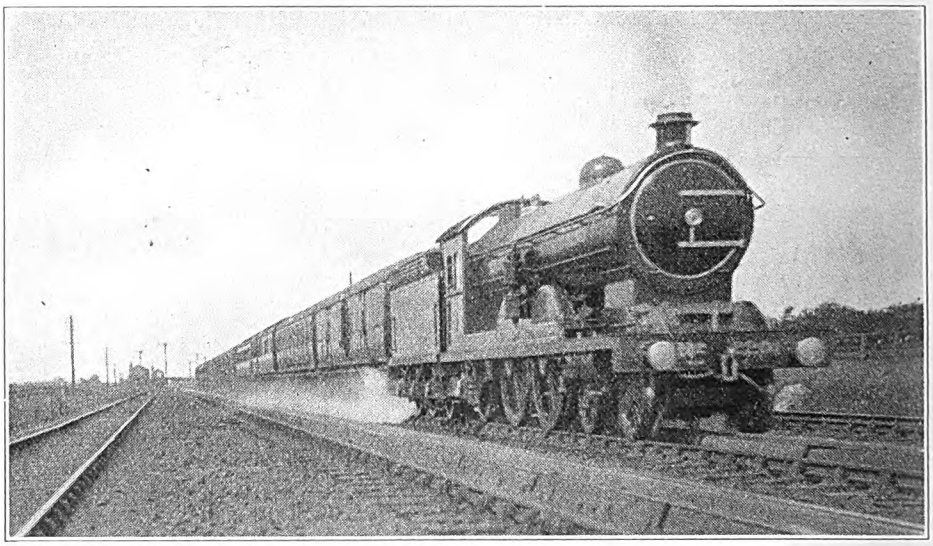

Photo.] [*W. Rogerson.*

L.N.E.R. UP "FLYING SCOTSMAN" PASSING OVER WISKE MOOR TROUGHS, NORTHALLERTON.

N.E. Section 3-cylinder 4-4-2 locomotive No. 2201, class "Z."

"The second run is representative of traditional performance on the crack trains. Speeds were 45 m.p.h. at Haresfield, 56 at Stonehouse, 46 beyond Wickwar, 55 prior to slacking through Mangotsfield, and 66 down to Temple Meads. The third run was the fastest I have had, but was a double-headed trip. The speed at Haresfield was 53, at Standish Junction 62, at Stonehouse 69, and till well beyond Berkeley Road we did not go outside the

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limits of 67 and 70 m.p.h., with several miles at top speed. The minimum past Wickwar was 54½. Subsequently we slacked to 45 at Mangotsfield, and were hopelessly delayed in the regular summer Saturday afternoon confusion outside Temple Meads.

"In the opposite direction are the first stages of the two runs on the 7.40 a.m. north-bound train, and also one on the mail. In the second column, however, I have substituted the best climb I have recorded to Mangotsfield, which was behind No. 438 with 185 tons; No. 505's work up the bank I neglected to time. The 'snippets' on the morning train are often run quite smartly, as these times reveal. No. 505, with a good load, accelerated to 51½ along the level and rising grades to near Yate, afterwards reaching a maximum of 70 down to Berkeley Road. On the next stage the running was very good, with a speed of 59 m.p.h. at Stonehouse, nothing below 52 up the 1 in 239 to Standish Junction, and a maximum of 67 on to Gloucester.

"No. 510 with her short train beat all my records. Speed was 51 at Yate, and down to Berkeley Road we reached 75½ m.p.h. The time of 4 mins. 45 secs. for the last 5·2 miles to the stop was remarkable, showing how cleanly the halt was made. Restarting, we passed Coaley at 54 an hour, Stonehouse at 60, Standish Junction at 55, and finally we sustained 70 to Gloucester. The trip on the mail was equally good with a substantial load. Up the 1 in 63–88 to Fishponds we sustained the excellent speed of 25 m.p.h. with 250 tons. From Mangotsfield we reached 45 an hour near Yate, and 70 down the 1 in 281. At Coaley speed was still 64 m.p.h., falling to 57 up the 1 in 272 beyond, and 51 at Standish Junction, after a brief spell at 58 from Frocester to Stonehouse. Down to Gloucester we ran at 65 m.p.h. This again was a run of a uniformly good character, and quite a fitting conclusion to my series."

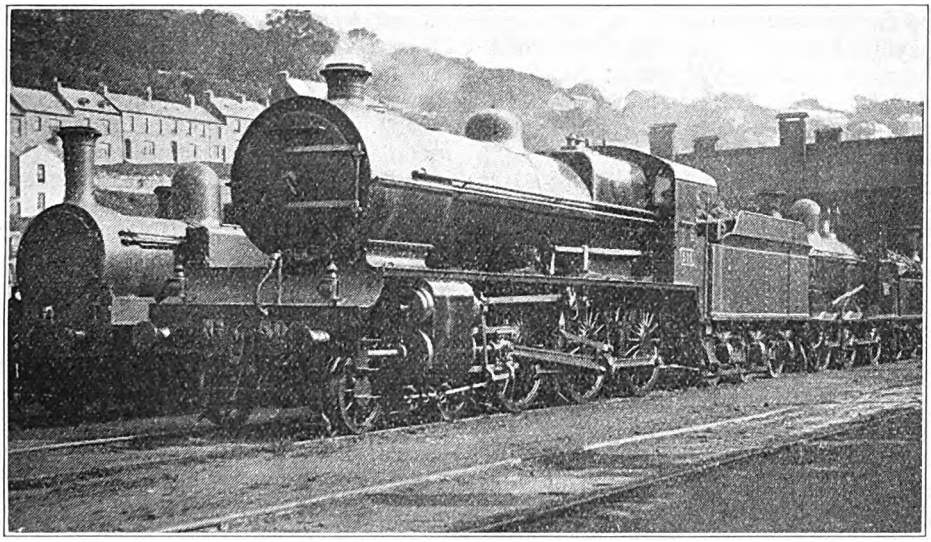

Photo.] [*R. Murphy.*

GREAT SOUTHERN RAILWAY OF IRELAND 4-6-0 LOCOMOTIVE No. 500 AT CORK SHEDS.

New 2-cylinder superheated mixed traffic type.

Our thanks are due to my correspondent for having told in so interesting a way his experiences over this route, with which readers have very often pressed me to deal, and with which, also, he has clearly so intimate a familiarity. My most recent experiences over the West of England line bear his out, and in conclusion I will mention one or two only. Coming south from Sheffield to Bristol on the Torquay train, we started by making a good run from Sheffield to Derby; the engine was No. 744 of Class 3, and the load of 34

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axles totalled 240 tons. Starting up the 5½ miles at 1 in 100, which constitute so serious a handicap to south-bound trains from Sheffield, we maintained a steady 31½ m.p.h., passing Dore and Totley, 4·3 miles, in 9 min. 20 sec. The subsequent descent was taken very easily, mostly with steam off and at about 60 m.p.h., though at one point touching 69; so we passed Chesterfield, 12·3 miles, in 18 min. 55 sec. Then followed sound work up the rising grades—mostly 1 in 300 or thereabouts—past Clay Cross to Stretton, on which the speed never fell below 50½ m.p.h.; after that we touched 71½ an hour at Wingfield, slacked to 45 round the Ambergate curves, and reached 64 beyond Duffield. So Clay Cross, 16·3 miles, was passed in 23½ min.; Stretton, 18·9 miles, in 26½ min.; Wingfield, 22·5 miles, in 30 min. 5 sec.; Ambergate North Junction, 25·9 miles, in 33 min. 10 sec.; Duffield, 31·2 miles, in 38 min. 55 sec.; and Derby, 36·4 miles, was reached in 44 min. 35 sec., instead of the 47 min. booked.

At Derby there was a slight modification of the load, to 230 tons, and Class 2 rebuild No. 520 came on. A signal check to 25 m.p.h. between Wilnecote and Kingsbury accounted for the bulk of 2 min. 50 sec. loss to Birmingham; we passed Repton in 9 min. 25 sec., touched 64 an hour, and then reduced to 40 through Burton, passed in 14 min. 10 sec.—an excellent figure for a Class 2 engine—and breasted Wichnor Junction in 20 min. 55 sec., and Tamworth in 29 min. 55 sec., after which came the check, with unenterprising work beyond. Speed fell to 45½ m.p.h. at Croxall, was sustained at 55 from Tamworth to Elford, and touched 60 at Wilnecote.

Out of Birmingham we had the assistance in rear of a 0-6-0 tank to Church Road, passed King's Norton in 10¼ min. and Barnt Green in 16 min. 55 sec., making the momentary stop at Blackwell in 18 min. 50 sec. The stop occupied 15 sec., and from the re-start to Bromsgrove 3 min. 25 sec., making together a total of 3 min. 40 sec. (for comparison with my friend's times). Dunhampstead was passed in 29 min. 25 sec. from Birmingham, Abbott's Wood Junction in 35 min. 55 sec., Defford in 40 min. 25 sec., Ashchurch in 46¼ min., and Cleeve in 50 min., Cheltenham being reached in 54 min. 50 sec. Speeds were a maximum of 66 below Bromsgrove, gradually falling to 61 at Abbott's Wood, but increased to 67 at Defford, then a minimum of 57½ at Bredon and a maximum of 62½ at Ashchurch. We also ran quite well from Gloucester, passing Haresfield in 9½ min., Stonehouse in 12 min. 55 sec., and Coaley Junction in 16 min. 50 sec., with a maintained speed of from 60 to 61½ m.p.h. between the two last-mentioned points. Berkeley Road was passed in 19 min. 20 sec., Charfield in 25¼ min., and Wickwar in 27 min. 40 sec., at a minimum speed of 45½ m.p.h., after which came a signal check to 30 m.p.h. So we took 34 min. to Yate, 40 min. 25 sec. to Mangotsfield (passed slowly), and after a very cautious descent past Fishponds, we drew up outside Temple Meads in 47 min. 5 sec. We should have made the run from Gloucester to Bristol in 46 min., but for the two checks; as it was, our time from station to station was 50 min. 20 sec., but even so we were only 2¼ min. late, after signal checks at Wilnecote, Churchdown (between Cheltenham and Gloucester), Yate and outside Bristol, the first and third severe and the second and fourth dead stands. This run was decidedly above the average Class 2 effort.

On another occasion, after No. 524, of the same type, with no banker out of Birmingham, had run rather poorly to Gloucester (Blackwell, 19 min. 35 sec., Bromsgrove, 23¼ min., Abbott's Wood Junction, 36 min. 50 sec., Ashchurch, 47 min. 25 sec., Cheltenham, arrive, 56 min. less 5 sec.), with 225 tons, I changed into the following Bournemouth train, which loaded to 200 tons, and was horsed by No. 521. From Gloucester we made a good start, passing Haresfield in 8 min. 40 sec., Stonehouse in 11 min. 55 sec., and Frocester in 13 min. 40 sec., at 65 m.p.h., but were then pulled up to 15 m.p.h. for p.w. relaying at Coaley Junction. Despite this we passed Berkeley Road in 21 min., and accelerating steadily up the ensuing rise to 47½ m.p.h., were through Charfield in 26 min. 55 sec. and Wickwar in 29 min. 20 sec., while Yate was passed at 61½ m.p.h. in 35 min. 5 sec., or not more than 32 to 32½ min. net. Mangotsfield North Junction, 31·4 miles, was cleared in 40 min. 20 sec., with a slack to 30 m.p.h.

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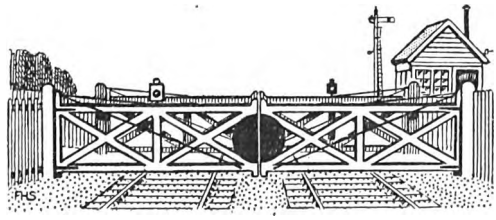
for the curve; Bitton, 35·3 miles, in 44 min. 50 sec., at 67 m.p.h., and after a very severe signal check through Weston, we reached Bath, 41·6 miles, in 54 min. 5 sec., or 50 min. net.

Another train on the West of England line on which good running is almost invariably done, is the 12·43 p.m. from Birmingham to Sheffield. It nearly always has a late start, and just as frequently the drivers attempt to make up the arrears. Unfortunately, being busy with other matters, and neglecting to time it, I missed at least two occasions on which we ran to Derby, inclusive of the Burton stop, in under 50 min., with a Class 2 engine and a 34-axle train of 225 tons, but I did record one trip with No. 511 and the same load, which is worthy of note. We passed Saltley in 4 min. 40 sec., at 50 m.p.h., Castle Bromwich in 8¼ min. at 57½, Water Orton in 10 min. 40 sec. at 60, shortly after increased to 65, Kingsbury in 14 min. 40 sec. at 61½, Wilnecote in 18 min. 20 sec. at 62½, and Tamworth in 20 min. 10 sec. at 64½ m.p.h. Then, unfortunately, the driver saw fit to reduce to 47 an hour over Haselour troughs, so that we took 24½ min. to Elford, at a regained speed of 61 m.p.h., 28¼ min. to Wichnor Junction, and 29 min. 35 sec. to Branston, passed at 66 m.p.h. So we reached Burton, 30·2 miles, in 33¾ min. start-to-stop, instead of the 36 min. allowed, and despite a halt there of 1½ min., and a very long and severe signal check outside Derby, we stopped at the latter station in 52 min. 20 sec., or 50 min. net, allowing for the concluding signal delays. Such runs as these show that many of our secondary main lines yield but little to the best-known main routes in the speed of their trains and the merit of their locomotive work.

I have just heard from my correspondent, by way of "stop press," that he has at last, and quite unexpectedly, seen that 17-min. booking from Birmingham out to Blackwell kept, and by a class 2 engine at that. But No. 490, on the 11.20 a.m. southbound, had a train of only 190 tons behind her. She passed Five Ways in 3¼ min., Selly Oak in 7 min., at 47 m.p.h., varied between 55½ and 50 on to King's Norton, passed in 9 min. 35 sec., after which a speed of 59 m.p.h. was reached in the subsequent dip; and passing Barnt Green in 15¼ min., stopped at Blackwell in 17 min. 5 sec. Despite some quite easy running after that, with no higher speed than 67½ m.p.h., Cheltenham was reached in 53½ min., or 52¾ min. net.



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THE RAILWAY PORTRAIT GALLERY.

MR. G. S. SZLUMPER,

Assistant General Manager,
Southern Railway.

MR. GILBERT SAVIL SZLUMPER, A.M.Inst.C.E., who has been appointed Assistant General Manager, Southern Railway, retaining also, for the time being, his duties as Docks and Marine Manager, is the only son of Mr A. W. Szlumper, C.B.E., Chief Engineer, Southern Railway. Mr. Gilbert Szlumper was educated at King's College School and the Engineering Faculty, King's College. After experience in the Engineering Department of the London and South Western Railway he was appointed Chief Assistant to the Central District Engineer in 1910. In 1913 he became Resident Engineer in charge of the track work, &c., of the London and South Western Railway electrification scheme, and also the Hampton Court Flyover Line. In February, 1914, he was appointed Assistant to the General Manager (Sir Herbert Walker), and acted as Secretary to the then secret Railway Executive Committee. During the war his chief work was the Secretaryship of the Railway Executive Committee, until in 1919 he returned to the London and South Western Railway service as Deputy Docks and Marine Manager at Southampton. At the end of 1920 Mr. Szlumper succeeded Mr. T. M. Williams as Docks and Marine Manager, London and South Western Railway Company, and in June, 1923, became Docks and Marine Manager for the whole of the Southern Railway.

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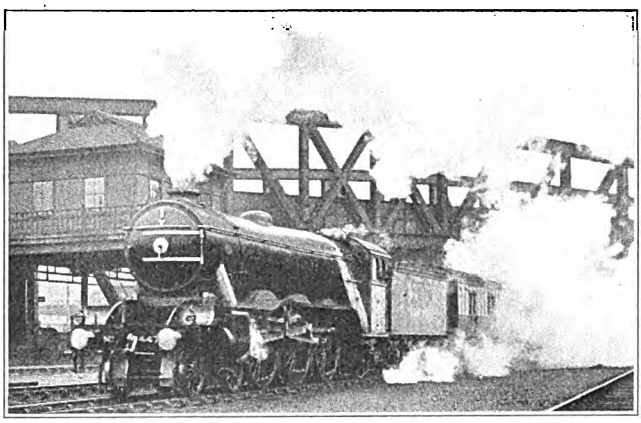

Photo.] [*F. R. Hebron.*

L.N.E.R. 4-6-2 LOCOMOTIVE No. 4474 LEAVING PADDINGTON ON G.W.R. EXPRESS.

The Locomotive Exchange.

LONDON & NORTH EASTERN "PACIFIC" *v.* GREAT WESTERN "CASTLE."

By "VOYAGEUR."

FEW railway events have attracted such universal attention in the Press and among the general public as did the exchange of express locomotives which took place between the London & North Eastern and Great Western Railways at the end of April. Beyond the transfer of engines between the different sections of each group, which has gone on extensively since the grouping came into force, there has been no comparable exchange since the series which concluded with the famous *Polar Star* versus *Worcestershire* trials of 1911, wherein the Great Western "Star" class four-cylinder 4-6-0 was pitted against the London & North Western "Experiment" class two-cylinder 4-6-0 engine. The manifestly inferior tractive power of the latter type, however, resulted in these trials being very one-sided in character, as was only to be expected.

But in the 1925 trials the circumstances are very different. In public estimation the two types under test established their rivalry by the claims made on behalf of each by their owners at the Wembley Exhibition of 1924, where *Flying Scotsman* and *Caerphilly Castle* figured on adjacent stands in the Palace of Engineering. By common consent the two engines represent the highest level to which British locomotive engineering has yet attained, and their performances, so familiar to readers of the RAILWAY MAGAZINE by their frequent description in the "British Locomotive Practice and Performance" articles, fully bear out this reputation. Thus, these trials have been throughout of a "neck-and-neck" character, and their interest, to railway enthusiast and locomotive expert alike, has been correspondingly enhanced.

It must not be supposed, of course, that the only object of the exchange has been to see whether each engine could haul the trains commonly allotted to the other. The published performances of both classes had left little doubt, even before the trials began, that the actual haulage would offer little difficulty in either case. But very close observation has been kept on coal and water consumption, and on the general behaviour of each engine during the continuous running of the test week proper, which was that ending May 2. In order to make the trials more complete, two *pairs* of engines were actually under test during the test week, No. 4074, *Caldicot Castle*, running the opposite workings to the L.N.E.R. "Pacific" on the Great Western system, and a "Pacific," No. 4475, *Flying Fox*, similarly running against the G.W. "Castle" over the Great Northern main line.

Of special interest to RAILWAY MAGAZINE readers is the fact that the engine chosen by the Great Western authorities for exchange was No. 4079, *Pendennis Castle*, which with her driver, W. Young, figured in Mr. Cecil J. Allen's vividly written account, in his article of last December, of a footplate journey to Plymouth on the "Cornish Riviera Limited" express. He was accompanied

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by Fireman Pearce. The London & North Eastern 4-6-2 engine selected was No. 4474, in charge of Driver A. Pibworth and Fireman Birkwood, of King's Cross shed. Each driver had the advantage of a number of preliminary footplate trips over the route which concerned him, and in addition to this, of course, pilot drivers accompanied the crews of the exchanged engines throughout the test trips. Driver Manning was pilotman over the G.W. main line, and Driver Day over the L.N. line. No one other than driver, fireman and pilotman was allowed to travel on the footplate during the actual test week.

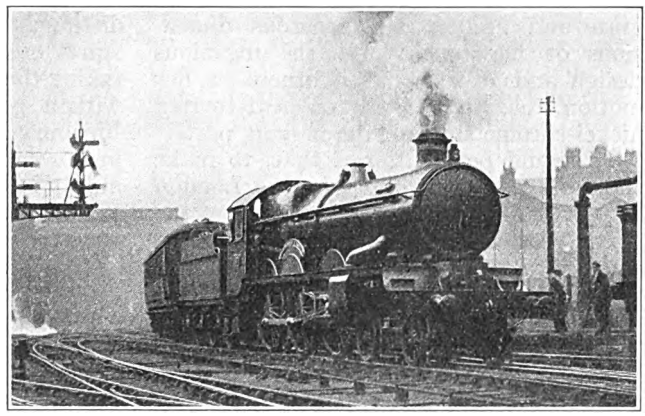

Photo.] [*F. R. Hebron.*

G.W.R. 4-6-0 LOCOMOTIVE No. 4079, "PENDENNIS CASTLE," LEAVING KING'S CROSS ON L.N.E.R. EXPRESS.

The engine workings, which will doubtless be of interest to readers, were as follows :—

WEEK ENDING APRIL 25.

Over L.N.E.R.

Monday—
10.12 a.m. (slow) King's Cross to Peterboro'.
2.58 p.m. Peterboro' to King's Cross.
Tuesday—
11.30 a.m. (semi-fast) King's Cross to Grantham.
4.14 p.m. ("Scotsman") Grantham to King's Cross.
Wednesday—
11.30 a.m. King's Cross to Grantham.
4.14 p.m. Grantham to King's Cross.
Thursday—
10.10 a.m. King's Cross to Doncaster.
Friday—
4.24 a.m. Doncaster to King's Cross.
Saturday—
Shed day.

Over G.W.R.

Monday—
1.30 p.m. Paddington to Plymouth.
Tuesday—
2.0 p.m. Plymouth to Paddington.
Wednesday—
1.30 p.m. Paddington to Plymouth.
Thursday—
2.0 p.m. Plymouth to Paddington.
Friday—
10.45 a.m. Paddington to Swindon.
1.50 p.m. Swindon to Paddington.
Saturday—
Shed day.

These runs were to familiarise the drivers with each route, as a preliminary to the test week proper, when the runs were as follows :—

WEEK ENDING MAY 2.

Over L.N.E.R.

Monday, Wednesday and Friday—
10.10 a.m. King's Cross to Grantham } 211 m. daily.
3.7 p.m. Grantham to King's Cross }
Tuesday, Thursday and Saturday—
1.30 p.m. King's Cross to Doncaster } 312 m. daily.
6.21 p.m. Doncaster to King's Cross }

Over G.W.R.

Monday, Wednesday and Friday—
10.30 a.m. Paddington to Plymouth } 226 m. daily.
("Cornish Riviera Limited" express) }
Tuesday, Thursday and Saturday—
12.30 p.m. Plymouth to Paddington } 226 m. daily.
("Cornish Riviera Limited" express) }

It may be well, at this stage, to recapitulate the leading dimensions of the two locomotive types under test :—

	L.N.E.R. "Pacific."	G.W.R. "Castle."
Cylinders	(3) 20 in. by 26 in.	(4) 16 in. by 26 in.
Driving wheels, diam.	6 ft. 8 in.	6 ft. 8 in.
Heating surface (total)	3,455 sq. ft.	2,312 sq. ft.
Firegrate area ..	41¼ sq. ft.	30¼ sq. ft.
Working pressure ..	180 lb. per sq. in.	225 lb. per sq. in.
Weight in working order—		
Adhesion	60 tons	59 tons
Engine, total ..	92½ tons	80 tons
Engine and tender, total	149 tons	120 tons
Tractive effort (at 85 per cent. of working pressure) ..	29,835 lb.	31,825 lb.

The Great Western engine thus gains a 25 per cent. advantage in the matter of her working pressure, which helps to bring her tractive effort some 2,000 lb. above that of her rival; and the chief assets of the London & North Eastern locomotive are doubtless the size of her fire-

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grate and firebox, the generous dimensions of her boiler, and the ingenious design and exceptional lightness of her motion, due to the use of heat-treated nickel-chrome steel for the moving parts.

It should be mentioned that, to make the tests as fair as possible, the London & North Eastern engine, while on the Great Western system, burned the Welsh steam coal usually employed on that railway, while *Pendennis Castle* was fed on the L.N.E.R. with the customary "Pacific" diet of Yorkshire coal.

As regards the actual running made by the two engines, Mr. Allen, who himself accompanied seven of the test trips, will give the logs, not only of these journeys, but also of other test runs, timed by correspondents, covering practically the whole period of the tests, in his July article, in order to allow the necessary time for the collection of the mass of data bearing upon this historic exchange. Meanwhile, however, some of the leading features of the two weeks may be briefly mentioned. Nothing of exceptional note occurred during the first week, while the drivers were learning the characteristic features of each road, at the head of the various trains previously mentioned. *Pendennis Castle* distinguished herself with some remarkable starts out of King's Cross, in particular taking the 10.10 a.m. down Leeds express, with a gross load of 330 tons, through Finsbury Park in 5 min. 15 sec., Hatfield in 22 min. 55 sec., Huntingdon (58·9 miles) in 59 min. 10 sec., and reaching Peterborough in 79 min. 50 sec., after a series of severe signal checks due to overhauling the "Scotsman" ahead. On the up "Scotsman," too, with 425 tons, some fine running was made against the handicap of half-a-gale from the west, the time from Grantham to King's Cross being 116 min. 45 sec., inclusive of three p.w. checks of varying severity. The "Pacific" was similarly distinguishing herself on the G.W.R., with such minimum speeds as 57 m.p.h., with 300 tons, and 60½ m.p.h. with 315 tons, on successive trips over Savernake Summit, coming east, for example.

But these were only in the nature of preliminary canters. The second week, No. 4474 was faced with the somewhat staggering task, for a stranger, of working the famous "Limited" every day for a week, down and up day and day about. Probably there were not very many Great Western observers who really thought that strict time would be maintained. Full load was taken, amounting to 530 tons all found from Paddington to Westbury, 455 tons on to Taunton, 390 tons thence to Exeter, and 310 tons over the mountains of South Devon into Cornwall. Yet, on the very first day, time was kept, and not only so, but out to Savernake, No. 4474 exceeded the times of *Pendennis Castle*, on the remarkable run of last year to which reference has already been made, by only 65 sec., which excess is exactly accounted for by the slower rate at which the "Pacific" negotiated the junctions at Reading. After that, the necessity for more cautious running over the curves with which the Great Western main line abounds, on account of the longer wheel-

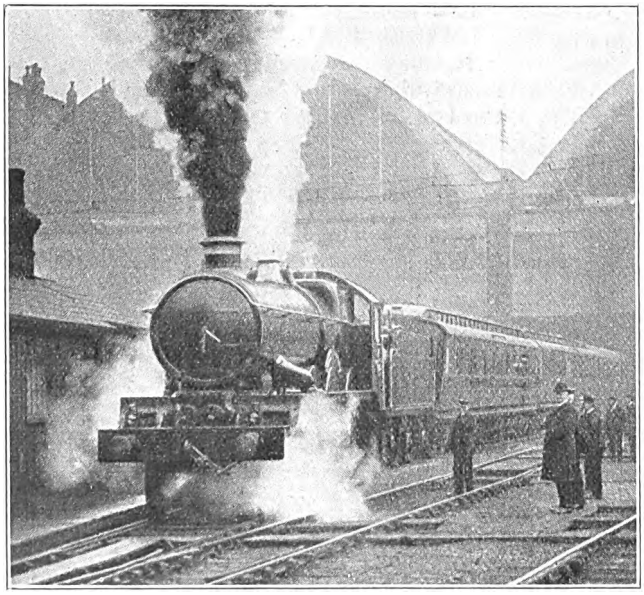

Photo.] [*Topical.*

G.W.R. No. 4079 "PENDENNIS CASTLE," ON 10.10 A.M. LEEDS EXPRESS, LEAVING KING'S CROSS, L.N.E.R., ON MONDAY, APRIL 27.

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base of the "Pacific," took her somewhat behind the times of the "Castle," but for all that, schedule times were closely adhered to throughout the run, and, indeed, throughout the week, on every day of which the arrivals were punctual. It is all the more to the credit of the crew that they succeeded in coaxing out of their engine uphill work sufficiently enhanced in merit to compensate for the enforced caution of the downhill running, on so tremendously difficult a turn as this.

The best running made by No. 4474 was probably that of the last down journey, when in spite of a tempestuous north-east wind, which was badly felt over every exposed stretch of line as far as Taunton, where the line turns southwards, only 2¾ min. were dropped to Westbury — notwithstanding a slack through Reading to 33 m.p.h. in place of the usual 40 or 45—after which the engine pulled up to a minute early through Taunton. This was one of the few occasions when any high speed was attempted, the maximum below Bruton being 80½ m.p.h. Some of the finest east-bound travelling occurred on the following day—the last of the test week—in particular the minimum speed, with 310 tons, of 31½ m.p.h. over Dainton Summit, which has never been equalled with such a load, so far as published records go; the time of 22 min. exactly, with 345 tons, from Exeter to Whiteball Box, inclusive of a minimum speed of 50½ m.p.h. at Whiteball Summit; and the extraordinary minimum rate of 64½ m.p.h. with the same load over Savernake, which compelled an appreciable slack immediately beyond to enable the engine to take the curve to Grafton Junction safely. Normal downhill speeds, to accompany these uphill feats, would have rendered possible record times of a striking character.

Meanwhile the *Pendennis Castle* was easily engaged in record-breaking over the Great Northern main line. Doubtless the majority of the Great Northern staff were equally sceptical as to the possibility of an engine of such apparently limited size (compared with their own "Pacifics") handling the enormous test trains to time, seeing that the loads of all the expresses on the test roster had been made up to a tare figure of just above 450 tons, which in most cases meant 475 to 480 tons with passengers and luggage. Yet, to the astonishment of all observers, without fuss or noise, or a vestige of slipping, *Pendennis Castle* falsified every prediction by taking her 480-ton trains through Finsbury Park in a time which averaged about 5¾ min.—an unprecedented figure, even for "Pacifics," with loads such as these. The first morning's run in the test week on the 10.10 a.m. down was quite typical—24 min. 40 sec. to Hatfield, 37¾ min. to Hitchin, 61 min. 10 sec. to Huntingdon, and 78 min. 50 sec. to the stop at Peterborough; sustained speeds of 48 m.p.h. up lengthy stretches of 1 in 200, and an average of 72·3 m.p.h. from Knebworth to Sandy, with a maximum of 83·3 at Three Counties, as a sample of what could be done downhill.

It was unfortunate that a bad relaying check at Corby, during the test week, caused delay, which occurred too late

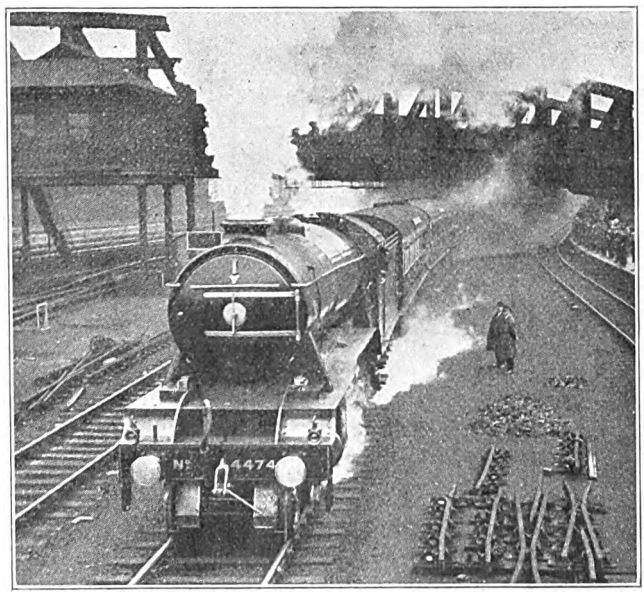

Photo.] [*Topical.*

L.N.E.R. No. 4474, ON 10.30 A.M. "CORNISH RIVIERA EXPRESS," LEAVING PADDINGTON, G.W.R., ON MONDAY, APRIL 27.

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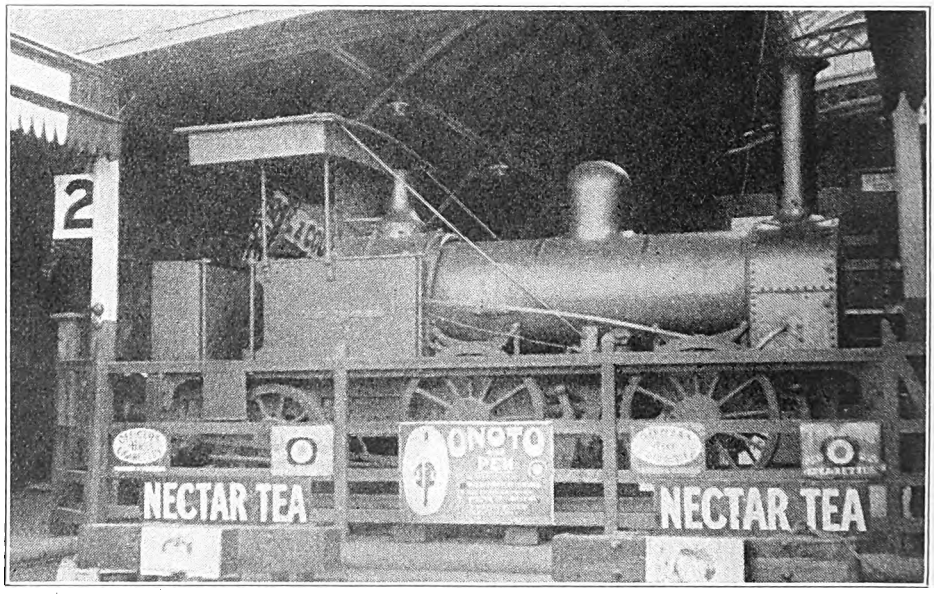
in the down journey to be recovered before Grantham, although practically all up delays were recouped by the engine. Of this the most notable instance was the signal stop of exactly 3 min. at Tempsford, which occurred when *Pendennis Castle* was working the 6.21 p.m. train from Doncaster to London; despite this serious delay, which cost fully 7 min., the arrival at King's Cross was only 2½ min. behind time. So *Pendennis Castle* handled with superlative ease every task with which she was entrusted.

It only remains to add that the trials were followed by the general public with an interest which has probably on no occasion been surpassed in railway history. Day after day large crowds of people gathered at every stopping place to see the classic rivals; indeed, at some terminals and more important stops, policemen were needed to keep the enthusiastic observers under proper control. Mile after mile, as one travelled in the trains, one noticed every railway servant, to a man, standing to attention as the "stranger" flew by; it might, indeed, have been a Royal progress. Only the records of coal and water consumption are now needed to complete the survey of one of the most fascinating railway happenings of our time.

THE FIRST LOCOMOTIVE IN SOUTH AFRICA.



We are indebted to Mr. C. G. Campbell Dickson for a photograph showing the first locomotive which worked on the Capetown and Wellington Railway. On page 213 of the March number, a poster was reproduced announcing the opening of this railway in February, 1862. The locomotive was built in 1859 by Hawthorn & Co., of Leith Engine Works, but, as illustrated in the photograph reproduced, has been on view at Capetown Suburban station for the last 10 years or so. According to an inscription alongside the engine, this is claimed to be the first railway locomotive in South Africa. In support of this claim, it is pointed out that, although the first railway in South Africa was a line from "The Point" to Durban in Natal, it is thought that the old Cape locomotive actually landed before any of the engines for the Natal line.

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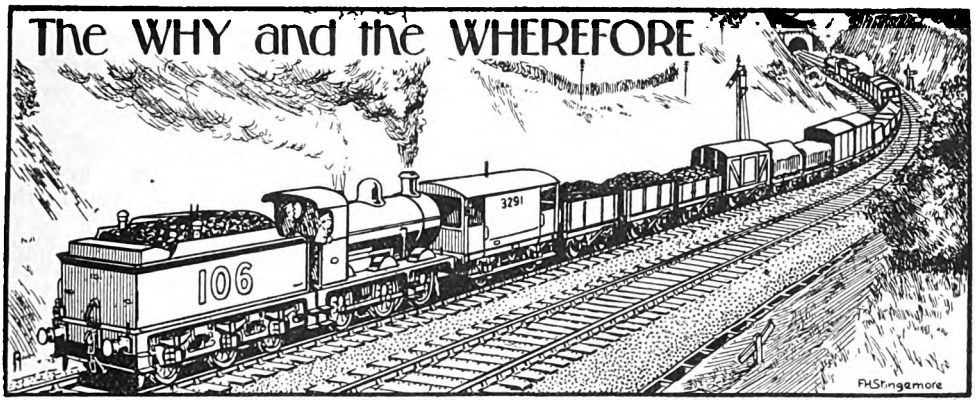

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Applications for information concerning "British Locomotive Practice and Performance" may be addressed to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, *33, Tothill Street, Westminster, London, S.W.1. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book"* (5*s. net*) *should be consulted. The twenty-seventh Annual Edition* (1924) *of this standard railway reference work is now published. All previous Editions are out of print.*

Brake Queries.

We are indebted to the Vacuum Brake Co. Ltd. for the following information in reply to your inquiries: It is pointed out in regard to the query in reference to maintaining the brakes on a train after an accidental parting of the vehicles, that the ball in the ball valve, provided that it is in good condition, as it should be, will maintain the vacuum above the piston for hours. It is further mentioned that wagons standing in a siding, with the brakes applied over-night, have had the blocks still hard on in the morning. With regard to the inquiry as to brakes on a box wagon, as there are no springs in the standard vacuum brake apparatus, it is thought that the inquirer is referring to the release lever in the ball valve. This release lever is operated by a cord from either side, and is attached to a diaphragm, through which the spindle which carries the lever passes so as to be air-tight. When the brake is released the diaphragm is drawn in by the pressure of the atmosphere on its outer side. To release the brake the wire cord attached to the brake lever is pulled. This moves the spindle and diaphragm, and raises the ball from its seat, admitting air above the piston. Obviously, when the cord is pulled, it requires some effort to overcome atmospheric pressure on the diaphragm, which thus acts in the manner of a spring attempting to force the ball valve spindle into its running position. As soon as the inside vacuum is destroyed, however, this spring action is neutralised. When vacuum is recreated in the train pipe, ball valve and cylinder, the diaphragm re-assumes its normal running position. Further remarks in your letter are noted.

[Reply to K. H. S. MASSEY.]

L.N.E.R. (G.N. Section) Locomotives.

The earlier 2-6-0 type engines on this section, originally numbered from 1630 to 1704 inclusive, and re-numbered from 4630 to 4404, are two-cylinder engines, and include the Kitson-built engines to which you refer. There then followed the 10 engines from 1000 to 1009 inclusive, now renumbered from 4000 to 4009; these are three-cylinder simple engines, with 6-ft. diameter boilers, and are considerably more powerful locomotives than those just referred to. An extensive further series of the engines last mentioned is now under construction at Darlington, various early blank numbers in the North Eastern numbering quota being allocated to the latter; the only difference is the provision of side windows to the cabs, and a cutting down of the boiler mountings to enable the

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engines to run over all main-line sections of the L.N.E.R. All three-cylinder engines exhaust six times to every revolution of the driving wheels, and this applies to the engines last described, as well as to the three-cylinder 2-8-0 and 4-6-2 engines of the same section.

Mid-Kent Railway.

The intention of the promoters of the Mid-Kent Railway, incorporated in 1855 under S.E.R auspices, was to make a line from the S.E.R. at Lewisham to the Farnborough Extension at Beckenham of the West End of London and Crystal Palace Junction Railway, and so provide a route to London Bridge for the Farnborough Extension, and also give the S.E.R. access to the Crystal Palace. In 1856 an extension eastward from Bromley on the Farnborough Extension to St. Mary Cray was authorised under the title of Mid-Kent (Bromley to St. Mary Cray) Railway. The London Extension of the East Kent (L.C. & D.R.) absorbed the lines, except the section Lewisham to Beckenham, which was in 1864 extended to Addiscombe Road. A study of a railway map will help to explain the seeming tangle.

[Reply to J. L. DUNK.]

L.M.S. (North Western) Goods Trains at Sheffield.

Access to the Park Goods Station at Sheffield by engines of the late London and North Western Railway is obtained by means of running powers from Nottingham. The trains in question travel over the late G.N. and L.N.W. Joint Line via Melton Mowbray to Nottingham, where they run on to the High Level through Victoria Station and on over the Great Central main line to Sheffield. There is a daily freight working with Great Northern engines between King's Cross and the Huskisson Docks at Liverpool via the Nottingham avoiding line, Sheffield, Godley Junction and Stockport, using the Cheshire Lines metals from Godley. We believe that this working has been in force for some considerable time.

[Reply to F. C. CLARK.]

Somerset and Dorset Joint Railway Locomotives.

"Consolidation" criticises the reply given in the April number, but, on submitting the matter to Mr. Ahrons, he explains that according to his records No. 11 was one of three engines sold or handed over to the London and South Western Railway about 1877 or 1878. Mr. Ahrons is not aware of the further history of this engine, but he recalls that in 1898 a 2-4-0 outside cylinder tank engine, built by G. England, was renumbered L. & S.W.R. 21 and named *Scott*. This engine had been rebuilt in 1887, but Mr. Ahrons suggests that this may have been the Somerset and Dorset engine in question. Apparently, too, this was a tank and not a tender engine.

[Further reply to C. J. C.]

Signalling at Killester, G.N.R. (I.).

As we were unable to understand the situation described in your letter, the matter was placed before the Great Northern Railway of Ireland, and Mr. John Bagwell, General Manager, informs us that ordinary practice only is followed at Killester. Apparently, you have interpreted as relating to signalling the stop valves working in connection with a water supply which runs alongside the railway. It is not the case that trains pass stop signals at "danger," and presumably it is the distant signal to which you refer. The "telephone boxes" are actually battery boxes, while the "peculiar device" mentioned by you is a stop valve for shutting off water in the event of a burst pipe.

[Reply to "DUBLIN READER."]

Size of Locomotives.

While the Canadian National 4-8-2 locomotives of the "6000" class probably rank as the heaviest passenger locomotives, there are many engines in the United States which would challenge comparison and many of freight classes which are certainly heavier. It would hardly be possible to increase the height and width of British locomotives owing to the tremendous number of bridges, tunnels and other restricting factors, alteration of which would involve prohibitive and probably unjustifiable expense. It may be possible in future to increase the strength of bridges and track to take heavier weights, but if tunnels are ever altered it would have to be a slow and gradual process.

[Reply to A. W.]

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G.W. Underground Services.

Practically from earliest days the G.W.R. has operated a number of through trains from Aldgate or Liverpool Street, running over the Metropolitan Railway east of Bishop's Road. These trains are worked by electric locomotives on the Metropolitan section and by steam engines on the G.W.R., changing at Bishop's Road. Some of them run to Southall, others to various other G.W.R. destinations, and there have been trains working as far as Maidenhead, Windsor and Reading. Examination of the time-tables will enable you to trace the present services, which are quite clearly indicated in *Bradshaw*, as well as in the railway company's publications.

[Reply to "DECAPOD."]

Trains between Central and West Stations, Tunbridge Wells.

There are eight passenger trains on week-days between the above stations in each direction. Prior to the grouping, when the trains were less in number, they were provided by the S.E. & C.R. and worked between Tonbridge and Tunbridge Wells West. This is still the general rule, but one evening train now works through from Charing Cross via Sevenoaks to Tunbridge Wells West. There is also one up and one down train between Tunbridge Wells and London Bridge (Low Level) via Tonbridge and Oxted, and one each way between Cannon Street and Tonbridge via Oxted, Ashurst and Tunbridge Wells West.

[Reply to "GOLDER."]

Locomotive Performance.

Mr. Cecil J. Allen's monthly articles are designed to give as general a survey as is possible in so small a compass of current British locomotive constructional practice and performance. We are aware that there are many main lines of secondary importance—such as the Gloucester–Newport route of the G.W.R. mentioned by you—over which excellent work is constantly performed, but it is necessary for Mr. Allen to confine himself chiefly to the main lines, in view of the limitations of space, as being the *venue* of the most representative performance. We have, however, passed your suggestion to him for consideration.

[Reply to "TEMPLE GUITING."]

Swing Bridges in East Anglia.

Pilotmen are used for several of the old swing bridges on the late Great Eastern Railway, where severely reduced speed is called for and a single line only is available. As the train has to slow up sufficiently for him to get on to and off the engine, the speed difficulty is thus overcome, while as he can pilot one train only at a time single line working is safeguarded. The new bridges are not expected to be brought into service as soon as you anticipate, though work is well advanced. There are numerous notable viaducts on Great Western main lines in Devon and Cornwall, as also on other sections.

[Reply to R. W. H.]

Accidents on U.S. Railways.

Accidents are far more numerous on U.S. railways than on those in this or any other country. It has to be remembered, however, that the mileage is about ten times that of the British Isles, and that a considerable part is unfenced and operated by train despatching and relatively free and easy methods, though most busy lines are now adequately signalled and well protected. One of the great weaknesses is the tremendous number of level crossings and the lack of care taken by motorists and other road users, the crossings not being, as a rule, protected in the way they are in this country.

[Reply to T. W. LINSELL.]

Southern Railway Electrification.

As we have already explained, as the route through Leatherhead is associated with South Western section train working to Guildford and beyond, that part of the line is being electrified on the South Western system. This will probably entail working all the electric train services to and from Waterloo, though no doubt there will be steam trains on the "Brighton" routes. How the problem will be overcome when it is decided to electrify further "Brighton" routes remains to be seen. Several short sections are at present left open and no doubt these will be filled in in due course.

[Reply to G. CULLIS.]

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Theatrical Specials.

From the particulars given in your letter, and if you are unable to trace the train in question in the public time-tables, we should assume that the train you have seen is one of those frequently run on Sundays to meet the requirements of theatrical parties transferring from place to place. There would, therefore, be no need for indicating destination on individual coaches, while the odd vehicles attached would be those required for the conveyance of scenery and properties. Such trains vary from week to week, according to the requirements of the traffic to be conveyed.

[Reply to "GUILDFORDIAN."]

L.N.E. (G.N.) Small "Atlantics."

Not any of the "990" class have been provided with "251" class boilers. In fact, this has not been done even with the "252" series, which were built at the same time as No. 251, with the idea that, if desired, they could be fitted with the same boiler as No. 251, though all "Atlantics" subsequently built corresponded with No. 251, except for the addition of superheating apparatus in the later series. We have no detailed information as to the new 0-6-0 side-tank shunting engines. They correspond generally with the series already in service.

[Reply to J. W. SAVIDGE.]

L.N.E. (N.B. Section) Locomotives.

Apparently, locomotives of the G.C. and G.N. types are being placed in service on the North British section to meet requirements for new engines, N.B. locomotives being diverted to secondary duties in place of old ones which are being scrapped. Presumably, the need would have arisen for new engines on the North British section, even had the situation not been altered as a result of grouping. Speaking generally, the Southern Scottish Area is the old North British section and the Northern Scottish Area the old Great North of Scotland Section.

[Reply to "WAVERLEY."]

Great Northern Main Line Distances.

As a special case, we give herewith the G.N. main-line distances required by you, although we cannot make a practice of giving lists of this character:—From King's Cross to: Harringay, 3 m. 32 c.; Oakleigh Park, 8 m. 30 c.; Greenwood Box, 10 m. 10 c.; Hadley Wood, 10 m. 46 c.; Ganwick Box, 11 m. 12 c.; Hawkshead Box, 14 m. 8 c.; Marshmoor Box, 15 m. 54 c.; Redhall Box, 16 m. 41 c.; Twenty-Mile Down Box, 19 m. 61 c.; Welwyn, 22 m.; Woolmer Green Box, 23 m. 39 c.; Langley Junction Box, 27 m. 4 c.; Wymondley Box, 29 m. 67 c.

[Reply to "L.N.E.R."]

British Rolling-Stock.

Speaking generally, the G.W.R. have no centre-corridor coaches except those equipped for use as, or with, dining cars. The automatic couplings used on the G.W.R., while similar to those used in the United States and Canada, include features initiated at Swindon. On particular trains on several lines centre-corridor coaches, with or without tables, are used, and on the L.M.S.R. the use of such trains is being extended, but, in general, British policy still favours the compartment and side-corridor type of coach.

[Reply to "CANADIAN RAILWAYIST."]

Southern Railway Electrification.

The question whether it would be possible to connect the Greenwich Park line of the L.C. & D. section with the S.E. line at Greenwich has already been discussed. We have no knowledge of any intention to make such a connection, even if it were practicable. You are presumably correct, however, in assuming that the Greenwich Park branch will be included in the electric scheme, and as a result will be re-opened for traffic. We hope to deal fully with electrification developments on the Southern Railway as a whole in due course.

[Reply to L. W. TUPPER.]

Guards' Vans, S.E. & C.R.

A number of vehicles are still in service on the S.E. & C. section of the Southern Railway having raised observation sections. Such vehicles were, at one time, common on many lines, the idea being that the guard was enabled to observe signals ahead, and otherwise keep an eye on the train, though the need therefor, since the general adoption of automatic brakes, has largely disappeared. Articles

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are occasionally included dealing with Continental railways, and we hope to do more in this way in due course.

[Reply to R. B. ATKINSON.]

The Fastest Train in Europe.

We are aware that the 7.10 p.m. from Paddington to Shrewsbury is making some remarkable running between Princes Risborough and Leamington. We note the time of 48 min. 10 sec. observed by you on this start-to-stop run of 52·9 miles, and understand that Mr. Cecil J. Allen has just recorded a run on the same train in 48 min. net, on which a maximum speed of 88 m.p.h. was attained below Southam Road, also with an "Abbey" class four-cylinder 4-6-0 engine. This express is evidently well worth watching.

[Reply to G. GATEHOUSE.]

Stour Valley Railway.

We presume you refer to the Birmingham, Wolverhampton and Stour Valley Railway, incorporated in August, 1846. The line was promoted by the Birmingham Canal Navigations to protect the canals in the neighbourhood of Wolverhampton, Birmingham and the Black Country from railway schemes hostile to the canals. The L. & N.W.R., however, leased the Navigations in 1846, and so it became easy for the L. & N.W.R. to lease in perpetuity the B.W. & S.V.R., which it did in 1847.

[Reply to J. L. DUNK.]

Standard British Locomotives.

We should describe the standard types as 4-4-0, 4-6-0, 2-6-0, 0-8-0, 2-8-0 and 0-6-0, though there are now a fair number of 4-6-2 locomotives in service. The Midland 0-10-0 is probably the only exceptional type in use. We cannot make any statement as to the most powerful locomotive, as that depends entirely upon what interpretation is to be given to the term. The "Abbey" class 4-6-0's of the Great Western Railway appeared in 1922, immediately prior to the "Castle" class.

[Reply to "TALISMAN."]

L. & S.W.R. Locomotives.

Mr. J. M. Adams points out that about 20 years ago a complete history of L. & S.W. locomotives to that date appeared in the pages of our contemporary, *The Locomotive*. This was, however, published in serial form, and the pages of the RAILWAY MAGAZINE have also included several articles dealing systematically and historically with either L. & S.W. locomotives as a whole or referring particularly to individual classes or the work of one or other of the locomotive superintendents.

[Further reply to S. CHILD.]

Railway Brakes.

No official intimation has been given as to the selection of either brake as standard on the L.M.S., L.N.E. and Southern Railways. The Westinghouse is generally adopted for electric traction. In other cases, the proportion of rolling-stock fitted with one or other which is brought under grouped ownership will probably govern the situation. Each type of brake has its particular features, but for British railway conditions, at any rate, they may be regarded as equally suitable.

[Reply to K. H. S. MASSEY.]

North London Railway Coaches.

Your query is not clear. The more modern North London coaches are now used, we believe, for the services to and from the L.N.E.R. We know nothing further about those stated to have been seen in France during the war. The Great Northern, Piccadilly and Brompton Railway coach you refer to was probably one of those used when the Piccadilly Tube was first opened. Probably the particular vehicle is not now in service. We cannot recall the colours used at first.

[Reply to "SET No. 14."]

L.N.E.R. Locomotives.

The original query related particularly to locomotive working over the G.N. route to Leeds. As pointed out by several readers, there is nothing exceptional in the occasional working of "Pacific" locomotives attached to the North Eastern area working to Leeds (New) station. In this connection, both the North Eastern and various new "Pacifics" of Great Northern type work to Leeds more or less frequently.

[Reply to A. A. TORRANCE and GORDON CASS.]

Kingswear Branch, G.W.R.

Engines up to and including Group "C" are allowed to work over this branch; this covers all the 0-6-0 and 4-4-0 tender types,

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the 4-4-2 and the smaller 2-6-2 tanks, and the two-cylinder 4-6-0 "Saints." It is found convenient, however, to entrust all the working locally to the small 4 ft. 7½ in. and 4ft. 1½ in. 2-6-2 tanks of the "45xx" and "44xx" classes, to which you refer. The double heading you mention is probably done to avoid occupancy of the single line by a light engine.

[Reply to "INTERESTED."]

Locomotive Exchanges.

Your query is not altogether clear. A "Pacific" locomotive of the L.N.E.R. should have not the slightest difficulty in running the 3½-hour Manchester trains of the L.M.S., which are by no means the most difficult locomotive turns of that railway, and are appreciably easier workings than many of the heaviest "Pacific" turns over the G.N. main line. You must form your own conclusions as to which railway provides the most "up-to-date" stock.

[Reply to T. H. PALMER.]

Southern Railway Tunnels.

Presumably you refer to the tunnel on the Brighton "Quarry" line just beyond Coulsdon station, situated between two steel girder bridges, each crossing the Brighton route. This tunnel was made to meet the objections of the London County Council authorities to the passage of an open line through the grounds of Cane Hill Asylum, and is therefore not a tunnel in the ordinary sense. Its length is, however, only about a quarter of a mile.

[Reply to "SNOW HILL."]

Special Workings.

The train you noted at Finchley Road (L.M.S.), consisting of L. & N.E. stock, and hauled by a Southern (L.S.W.) locomotive, was doubtless a special working through from the one system to the other via the North and South Western Junction line, Willesden Junction, Gospel Oak, Canonbury, Hackney and Victoria Park (to G.E. Section), or possibly to G.N. Section via Canonbury. There is no regular through working of this character.

[Reply to G. M. M.]

Atmospheric Railways.

Our previous references collect most of the information which is available. As the bridges mentioned received attention on the basis of contemporary accounts, it is to be presumed that they existed in those days, if not more recently. Your suggestion as to "Notable Railway Station" articles will be borne in mind.

[Reply to J. M. ADAMS.]

Distant Signals, L.N.E.R.

In view of the fact that on the Great Northern section distant signals are now painted yellow, it is probable that the practice will be extended to other sections in due course. We have no information as to the alteration of the 12.30 p.m. train from Sheffield to Glasgow, L.M.S.R. If it still runs via Dumfries and Kilmarnock, obviously it must change to the Caledonian section near Strathbungo to reach the Central station.

[Reply to RALPH HALKETT, jnr.]

Tenders.

We know of no heavier six-wheeled tenders in use than the new standard tenders fitted to the latest Great Southern Railway of Ireland 4-6-0 engines, with a capacity for 7 tons of coal and 4,500 gallons of water. The tender fitted to the North British "Atlantics" of the L.N.E.R. runs this capacity close, however, holding 7 tons of coal and 4,240 gallons of water. Respective weights in working order are 48 tons and 45½ tons.

[Reply to K. A. MURRAY.]

Wire-Worked Points.

It is most unlikely that there are any wire-worked points now in service on any main line of the Midland Division of the L.M.S.R. The late Midland Railway did, however, work some of its trailing points by wire, though we believe every instance of such working was replaced by rod operation in the middle 'eighties, except that some of those in shunting yards remained unaltered for some time afterwards.

[Reply to "ASHPAN."]

"Electric Vans," Southern Railway.

Reference was primarily made to a few vans which were fitted up for dealing with milk and miscellaneous traffic. The new electric trains include one of these vehicles (though whether they should be correctly

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described as electric locomotives or as motor vans remains to be seen), with trailers attached fore and aft as required. No doubt these vans can be used as locomotives, and possibly are to some extent.

[Reply to F. N. LANCE.]

"Foreign" Train Working.

No doubt, the M.S. & L. train which you noticed some years ago on the Great Northern Railway at Finsbury Park station had been used for a special of some kind and the empties were being worked to Wood Green for storage. Arrangements of this kind necessarily occur frequently on all lines, while, under grouping, rolling-stock from unusual sections is, of course, frequently to be seen.

[Reply to A. BARBER.]

L.M.S. Tank Engines.

The engine you noted at Bristol is one of the general service 0-6-0 tank locomotives recently constructed at Derby and used on various divisions of the L.M.S.R. As several L.N.W. locomotives are now, or have been, working on Midland Division lines, it may be that in due course some of them will come to Bristol, though we have no knowledge of any such development as immediately probable.

[Reply to A. J. TUDBALL.]

Speed at Junctions.

The fact that a junction means that there is a diverging route generally entails that trains taking one side of the junction must reduce speed for curves beyond, if not because of the layout of the actual junction. There are, indeed, few instances where both routes can be taken at unrestricted speed, though this is governed by the situation and not by the fact that facing points are concerned.

[Reply to D. S. FOULKES-ROBERTS.]

Westinghouse Brakes.

A description of the Westinghouse brake was included in the late Mr. D. Drummond's "Lectures on the Locomotive," mainly owing to the fact that a certain number of L. & S.W. locomotives were fitted with that brake to enable them to work "foreign" trains as required. It was not, however, used in purely South Western services, either passenger or goods.

[Reply to W. F. BATHURST.]

Railway Telegraph Instruments.

For information in regard to these, it would be necessary to refer to books dealing with railway signalling, several of which are mentioned in the "Railway Bibliography" published in the *Railway Year Book*. We have no information as to proposed alterations at South Town, Yarmouth, L.N.E.R. Your kind remarks in regard to the RAILWAY MAGAZINE are appreciated.

[Reply to "METROGEN."]

L.N.E. (N.B. Section) Locomotives.

As we have many times explained, the space required to give detailed particulars of the locomotives of any one railway, or of any large section thereof, would be far too much to be considered in the pages of the RAILWAY MAGAZINE. We are not aware of any published list of engines of the North British section, and you would have to collect particulars as you could obtain them.

[Reply to "WANDERING WILLIE."]

Derelict Locomotive.

We have not been able to ascertain anything about the firm of Lennox & Dance which would justify their name appearing on an old locomotive noted by you as lying derelict in a field. One of our contributors suggests that this is the name of a company to whom a firm of locomotive builders supplied a locomotive, attaching the name of the owners.

[Reply to G. WOODCOCK.]

L.M.S. Scottish Locomotives.

We have no information supporting your view that certain Caledonian and Highland locomotives which are fitted with the Walschaert valve gear have a form of that gear modified in important respects from ordinary practice. So far as we know, the application is merely that necessary to adapt the gear to meet the requirements of a particular design.

[Reply to C. G. CAMPBELL-DICKSON.]

Working of Superheater Engines.

It is difficult to give any precise explanation of the interesting matter that you raise. It is probably not unconnected with the use of piston valves in place of the previous slide valves, as all the types of locomotive mentioned by you we believe

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to be piston-valve engines, but further than this we fear we are unable to enlighten you.

[Reply to "HAYMARKET."]

The Manchester Pullman, L.N.E.R.

Route of this train is via the G.N. main line to Retford, and thence over the G.C. section to Sheffield and Manchester (Central). The fastest schedule time that we can trace over this route, during the Manchester competition of the 'eighties, was one of 4 hr. 13 min. between King's Cross and Manchester; this the new Pullman service beats by 3 min.

[Reply to P. G. CUNNINGHAM.]

Southern Railway Electrification.

It is, presumably, owing to the complication created by the fact that both South Eastern and Brighton section trains will require to use the route through New Cross and Forest Hill to Norwood Junction that no steps are yet being taken for electrifying that section. It will still be necessary to serve those stations by steam trains.

[Reply to R. NEWMAN.]

Piloting on L.N.E.R. (G.N. Section).

Piloting on the G.N. Section with so few as 10 coaches is an unusual phenomenon, and the leading engine was doubtless being worked to Grantham in this way for some special purpose. The new chimney on No. 3041 (4-4-0) is a new standard cast-iron pattern intended to be applicable to various L.N.E. types.

[Reply to C. W. BUSH.]

Marlborough Tunnel.

We understand that the single line through Marlborough tunnel, on the late M.S.W.J.R. section of the G.W.R., is a temporary measure in view of maintenance work which is going on there. This explains why double line is maintained at each end, but not in the middle, of the tunnel for the time being.

[Reply to E. H. L. W.]

Leatherhead Station, S.R.

As we understand the description of the alterations contemplated at this station, a connection will be made from the "Brighton" station to the L.S.W. route to provide for steam trains on the latter, the object being to concentrate traffic at one station only, and not to reduce facilities.

[Reply to R. H.]

L.N.E.R. (G.E.) Locomotives.

A large number of the 1500 class 4-6-0 engines are fitted with ash ejectors, but the 1780 class "super-Claud" 4-4-0 engines are not so fitted. Judging by the new Continental train which has just been put into service, it is not intended to build articulated main-line stock for the G.E. section.

[Reply to E. J. READ.]

Electric Traction, S.R.

The cables you have noticed placed on supporting posts alongside the track are, presumably, those for distribution of electric current. The connections between adjoining rails are bonds as required, either where the rails are used for current return or where track circuit is installed.

[Reply to P. G. PHILLIPS.]

Southern Railway Electrification.

The statement that 647 track-miles are to be electrified means, of course, what it says, running tracks measured separately and any sidings or loops which may be concerned. You can work out the route distances by studying the particulars given and calculating the distances involved.

[Reply to P. A. C.]

Southern (L. & S.W.) Railway Locomotives.

The colour now used for Southern Railway passenger engines is slightly darker than that associated with the "Adams" and "Drummond" locomotives. It is, however, substantially the same as that used for engines built by Mr. Urie, and was introduced some 12 years or so ago.

[Reply to "SOUTH WESTERN."]

Colne Valley Railway.

We have no knowledge of any change relating to the working of the last train from Marks Tey to Haverhill in regard to the use of the Colne Valley station at the latter place instead of the Great Eastern station. Your kind remarks in regard to the RAILWAY MAGAZINE are appreciated.

[Reply to F. STAPLETON.]

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Through Locomotive Working.

Since drafting the reply under this heading on page 314 of the April issue, we are given to understand that the G.W. locomotive authorities have instituted through locomotive workings between Paddington and Penzance, in certain special cases, crews being changed *en route*.

[Further reply to B. STEWART BROWN.]

Rolling-Stock Numeration.

Although they may be used for set trains, it does not follow that the vehicles included belong to the same construction series. Further, as they would necessarily include several variations of class, obviously they would be numbered in their class series and not in train order.

[Reply to C. M.]

Check Rails.

You do not give sufficient description of the "third rail" you have seen at Albert Dock Station, but we assume it must be a check rail, as used on curves. We have no information as to the future locomotive rebuilding intentions of the railway you mention.

[Reply to R. E. BROWN.]

5 ft. 8 in. 2-8-0 Engines, G.W.R.

It is very unusual for one of these engines to appear on a Bristol express, but the semi-fast trains on this service are occasionally so hauled, as a matter of convenience in engine working. The 2-hour expresses are invariably hauled by the two-cylinder and four-cylinder 4-6-0 engines.

[Reply to A. V. T. CHUBB.]

"Castle" Class Locomotives, G.W.R.

Surely you are aware that *The Great Bear* was a "Pacific" locomotive, so that its conversion to a 4-6-0, as *Viscount Churchill*, has involved essential changes. The reconstructed engine was illustrated and described in the RAILWAY MAGAZINE for November, 1924.

[Reply to S. M. W.]

Prize Lengths.

We have several times explained that periodical prizes are awarded to permanent way gangs on various railways for lengths which have been kept in first-class condition, and such are indicated by a notice, "Prize Length," one of which came under your attention.

[Reply to "SNOW HILL."]

Southern Railway Tenders.

The L. & S.W. locomotives now used on the S.E. & C. section have probably been given six-wheeled tenders as they have sufficient water capacity for use on that section. It may be that the eight-wheeled tenders are required for other engines.

[Reply to E. H. L. W.]

Aintree Specials.

As a rule, the special trains run from London to Aintree, both by L.M.S. and L.N.E. routes, are booked non-stop or are scheduled to make service stops as required. These may vary for each train. We are unable to go further into this matter.

[Reply to G. CULLIS.]

L.M.S. (Midland) Queries.

From Nottingham to Chesterfield, via Radford and Trowell, is 28 miles 28 chains. The 9 a.m. from St. Pancras to Edinburgh is booked to leave Leeds 1.23 p.m., to call at Skipton 1.57–1.59 p.m., and to reach Carlisle 3.41 p.m. (working times).

[Reply to H. KNIGHT.]

Stroudley Locomotives.

A fair number of Stroudley 0-4-2 express locomotives are still in service, and there is nothing exceptional in seeing one of them hauling secondary or lighter express trains, while on incidental duties they often take considerable loads.

[Reply to D. M. JOHNSTON.]

Corringham Light Railway.

This railway has no direct connection with the Tilbury section of the L.M.S.R., but its terminus at Corringham is not a great way from Stanford-le-Hope station. It is mainly operated for the benefit of Kynoch's employees.

[Reply to F. STAPLETON.]

L.M.S. Power Classification.

Calculations on which this classification was based were detailed in our issue for February, 1924. The low classification of the type you mention is due chiefly to comparatively small cylinders and fire grate area.

[Reply to E. W. HODGE.]

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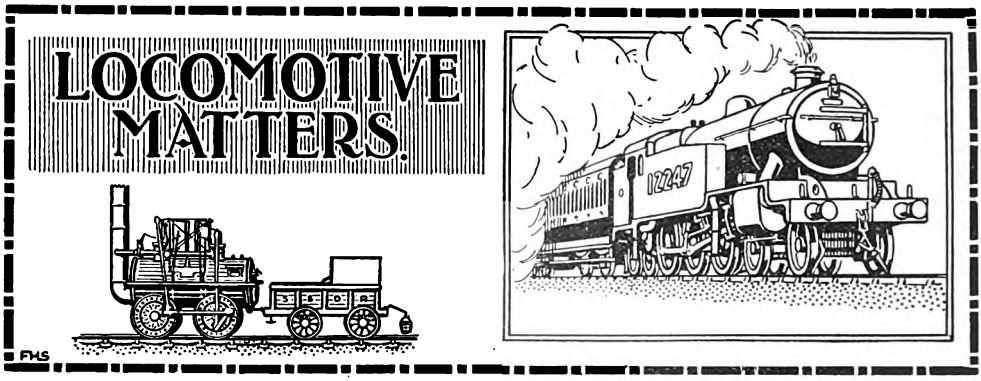

Under this heading will be inserted short references to news items relating to locomotive engines and their duties. It must be understood, however, that information as to the stations of particular engines cannot be given, for the reason that, before the date of publication, transfers may have taken place, while lists of engines, &c., debarred from "The Why and the Wherefore" section, cannot be included under this heading. With this understanding, notes as to matters thought to be of general interest will be welcomed.

L.M.S.R.

No. 1086 is the latest compound 4-4-0 engine working to and from St. Pancras.—[J. H. A. Wilkins.]

Compound 4-4-0's Nos. 1059, 1069 and 1081, together with large 0-6-0 goods locomotives, including No. 4409, are at work in the Gloucester district, though the bulk of the main line work is dealt with by class "2" engines. An outside framed Kirtley 2-4-0, No. 2, is still running on slow trains, and has been stationed at Gloucester depot. 2-4-0 locomotive No. 167 is rebuilt with a Belpaire pattern boiler.—["P. R."]

Of the new "7100" class of 0-6-0T's, two have been seen in Beeston sidings, one shunting at Doe Hill station, and two in Camden sidings. Furness 0-6-0 engine No. 12507 was observed hauling a down goods train for Leeds piloted by Midland 2-4-0 engine No. 248.—[J. More.]

Midland section 4-2-2 engine No. 728 is shedded at Brunswick, Liverpool, and 4-4-0 No. 335 has been working trains over the Cheshire lines.

L. & Y. 4-4-0 No. 10163 is working trains between Sheffield, Cudworth and Wakefield, apparently in turn with Classes 1 and 2 Midland 4-4-0's. No. 10159, another L. & Y. 4-4-0 of the same class, was recently seen working trains from Chesterfield to Rotherham and back to Sheffield.—["Dagmar" and K. J. Holmes.]

Additional L.N.W. section locomotives rebuilt with Belpaire fireboxes and "pop" safety-valves include "Prince of Wales" class 4-6-0's Nos. 224 (Patricroft), 401 *Zamiel* (Holyhead); 1133, *Sir John French* (Crewe); 2417, *Atlas* (Crewe); and 8717, *Raymond Poincaré* (Rugby), together with "George the Fifth" class 4-4-0's Nos. 1092, *New Zealand*, and 1623, *Nubian* (Holyhead); class G1 0-8-0's Nos. 360; 1129 (Edge Hill); 1300 (Edge Hill); 1485; 1729; and 2199; and 18-in. 0-6-0 goods Nos. 64 (Speke Junction); 65 (Speke Junction); 577; 1034 (Wigan); 1716 (Mold Junction); and 2329.—["Dagmar," A. L. McCrindell, and J. T. Thorpe.]

A new Crewe-built 0-6-0, No. 4111, was seen at Rugby on an up goods train, and 0-6-2T, No. 7683 (formerly L.N.W.R., No. 3029), at Aston (Birmingham). Two L.N.W. section railmotors have been painted in L.M.S. colours, and now bear the numbers 10696 and 10700. These have been employed on the Oxford and Bicester service.—[J. L. Thorpe.]

A L.N.W. section class 32, No. 547, fitted with Belpaire boiler, sometimes hauls passenger trains over the Furness section. Ex. M. and C. locomotives Nos. 12513 and 12514 are in regular service in the same district. A 0-6-2T engine, No. 11642, has regular charge of the Lakeside branch trains.—[G. W. Keen.]

Two new 0-6-0's, Nos. 4178 and 4180, are working on the G. & S.W. section, and a Caledonian 4-4-0T, No. 15021 (formerly No. 2), was seen shunting at St. Enoch's station. 0-4-0T, No. 16041 (formerly G. & S.W., No. 658) is engaged at Kilmarnock works, while No. 659, the only other of the class, is at Inverness.—[W. E. Boyd.]

Caledonian 4-6-0 locomotive No. 903, formerly named *Cardean*, is now unnamed and bears the L.M.S. No. 14752.—[P. Ransome Wallis.]

No. 4114 is the latest 0-6-0 superheater goods engine (Midland Class 4) to be put into traffic at Crewe. With the exception of No. 4107, which has been finished in the newest style for goods engines—*i.e.*, plain black with the initials L.M.S. on a red

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background—these engines are appearing in shop colour, but with the usual number in large yellow figures (instead of gold) on the tender sides. In accordance with Crewe practice, these engines have been allotted Crewe works numbers. The first of the type, No. 4107, begins at 5753, and the others follow on in succession. No. 2566 has been converted from Class "G" to Class "G 1" (superheater), and provided with a standard Belpaire boiler. Other modifications include vacuum brake with two sacks, air pump and carriage heating apparatus. Latest engines to be fitted with standard Belpaire boilers include the following:—Prince of Wales class: Nos. 123, 125, 224, 258, 518, 1466, 1559, 1679, 1691, 1704, 1732, 2417 and 5777 (old 248); "George V" class: Nos. 513, 1294, 1623, 1730, 2081 and 2212; "G 1" and "G 2" classes: Nos. 500, 576, 872, 885, 1012, 1485, 1729, 2199, 2274, 2343, 2383 and 2441; 18-in. goods class: Nos. 64, 278, 318, 335, 534, 539, 541, 577, 651, 689, 777, 801, 912, 1022, 1260, 1268, 1382, 1496, 1641, 1716, 1718, 2306, 2327, 2328, 2329, 2335 and 2344. Recent withdrawals include No. 1923 *Agamemnon*, the last remaining of the old "Jubilee" compounds; also the "Spare Engineer," a left 2-4-0 curved link engine (formerly *Engineer*).—[C. WILLIAMS.]

L.N.E.R.

The undermentioned locomotives from other sections were noted at King's Cross shed on April 25, for the Cup Final: N.E. class R1 4-4-0's Nos. 1204, 1236 and 1239; class Z 4-4-2's Nos. 704, 2200 and 2211; G.C. four-cylinder mixed traffic 4-6-0 No. 5482.—["L.N.E.R.," "MIKADO," AND "HAWKSHEAD."]

G.N. "Mogul" locomotive No. 4646 was seen at Neasden sheds on Cup Final day, and G.C. 2-6-4T No. 5274 was among the engines employed on Wembley specials.—[W. G. BOYDEN.]

The 6.5 p.m. Sheffield Pullman was recently hauled from King's Cross by G.C. section inside cylinder 4-6-0 locomotive No. 5425, *City of Manchester*.—[C. L. P. QUESTED.]

G.N. "Atlantics" Nos. 4420, 4428, 4429 and N.E. 4-4-0 No. 1239 have been stationed at Sheffield, G.C. locomotive depot. G.N. local trains in the Nottingham district have been worked by G.E. 2-4-0's Nos. 7447 and 7450.—[C. H. E.]

G.C. 4-6-0's, Nos. 1164C *Earl Beatty* and 1169 *Lord Faringdon*, are in Gorton shops for overhaul. Many repaired engines leaving Gorton works have the new standard chimney fitted. The second batch of R.O.D. locomotives have been delivered to Gorton, and wait their turn for the shops. G.C. 4-6-2T No. 5372 has had her cab altered for service in the Leeds area. No. 436 *Sir Berkeley Sheffield* is stabled at Brunswick Sheds, Liverpool, for working Hull expresses. No. 6165 *Valour* is again working on the G.N. section.—["DAGMAR" AND C. J. WOODNUTT.]

G.N. "Pacific" No. 4479 has been named *Robert the Devil*. "Pacific" engines Nos. 2556, 2557, and 2558 are at Grantham. No. 6102 has been transferred from Liverpool to Peterborough in place of No. 4412 sent to the former depot.—[G. M. R.]

G.N. 4-4-0's in turn with G.C. 4-4-0's work Sheffield–Retford–Lincoln trains and Doncaster locals; G.C. 4-4-2T's also appear on these latter trains. Trains for York, Newcastle and Scotland are worked from Sheffield by N.E. class Z "Atlantic" locomotives.—[K. J. HOLMES.]

4-4-0 locomotives of the "Director" class Nos. 6378–6401 are being named after various characters in Sir Walter Scott's novels and poems. This is done in the N.B. style, gold lettering on the driving wheel splashers. Among those which have so far received names are Nos. 6378 *Bailie Macwheeble*, 6379 *Baron of Bradwardine*, 6380 *Evan Dhu*, 6385 *Luckie Mucklebackit*, 6398 *Laird of Balmawhapple*, 6400 *Roderick Dhu*, 6401, *James Fitz-James*. All these engines are doing excellent work, and are popular among the men. A 0-6-0 type engine of G.C. design No. 5664 is working goods trains between the N.B. and G. & S.W. lines via the loop at St. Enoch's, Glasgow. No. 4692 two-cylinder 2-6-0 on a recent occasion hauled the evening Cadder to Carlisle goods.—[W. E. BOYD, W. L. ROBERTSON, AND P. RANSOME-WALLIS.]

G.W.R.

4-6-0 locomotive No. 4009, *Shooting Star*, has been rebuilt with a "Castle" class boiler and cab. Five new "Castles" are in course of completion. Engines of the "56" class, numbers from 5600 to 5619, have been turned out from Swindon. Of the "73" class, Nos. 7320 and 7321 are already in traffic, while Nos. 6362, 6363 and 6364 will be out shortly.

Among engines recently sent into Swindon shops for rebuilding are Nos. 669 (0-6-0T, ex Alexandra Dock No. 20); 618 (0-6-0T, ex Rhymney No. 50); 560 (0-6-0T, ex Taff Vale No. 152); 978 (0-6-0, ex Taff Vale No. 356); 511 (0-6-2T ex Taff Vale No. 74); 1126 (ex M.S.W. 4-4-0 No. 8); 25 (M.S.W. 4-4-4T No. 17); 1380 (ex B.R. 0-8-2T No. 79); 251 (ex B.R. 0-6-2T No. 60); 210 (ex B.R. 0-6-2T No. 16); 720 (ex B.R.

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0-6-0T No. 100); 1426 (ex A. (N.) D.R. 0-4-2T No. 14); 190 (ex A. (N.) D.R. 0-6-2T No. 29).

Among the many pannier tank engines that have been fitted with a closed-in cab and bunker similar to that fitted to the small class of 2-6-2T's are Nos. 732, 1294, 1642, and 2023; this last has a Belpaire firebox, while the boiler is domeless. Engines taken over from Welsh and other lines now have a number-plate bearing the name of the previous owning railway with the old number on the lower rim, the letters G.W.R. being on the plate above the running number.—[R. ABBOTT and H. ROBINSON.]

Several of the recently built small 2-6-2T's are working suburban trains in the Birmingham district. Among those noted were Nos. 4556 and 4559–4562. Two of the rebuilt M. and S.W.J.R. 2-4-0's, Nos. 1334 and 1335, are stationed at Didcot. No. 1294, a "pannier" tank stationed at Oxford, is the first tank engine noticed in that district fitted with the new enclosed cab. No. 2194, *Kidwelly*, a small 0-6-0T taken over from the Burry Port Railway and numbered 4 by that company, was recently seen at Oxford.—[J. L. THORPE.]

A new "Castle" class locomotive, No. 4083, *Abbotsbury Castle*, is now in service.—[R. O. HOLT.]

S.R.

S.E. & C. section Stirling rebuilt 0-4-4T locomotive No. 138 is out in the new sage-green colour similar to that used for the coaching stock. L.S.W. 4-6-0 No. 453E, *King Arthur*, recently worked the 1.6 p.m. train from Charing Cross to Folkestone and Dover, returning to Charing Cross on the train due there at 6.30 p.m.—[J. A. HINES.]

It is pointed out that the engine employed to haul the special train from Victoria on the occasion of the King's journey to join the Royal Yacht in the Mediterranean was 4-4-0 No. 160A, and not 165E as previously reported.—[T. H. DONOHUE.]

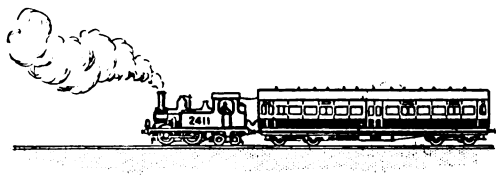
L.B.S.C. 4-6-2T No. 326, formerly *Bessborough*, has left the paint shops in the new style of dark-green livery, and has a number plate fixed on the back of the bunker. 0-6-2T locomotive No. 404B has been withdrawn from the S.E. & C. section and replaced by 0-6-2T No. 593B, which is working the same duties.—[R. G. BOLTON.]

The through express from Brighton to Cardiff and Ilfracombe is being worked by L.S.W. section locomotives and men as between Eastleigh and Brighton; on Easter Saturday No. 570E, an Adams 4-4-0 engine, hauled this train.—[T. H. DONOHUE.]

Among the L.S.W. section rebuilt small 4-4-0 locomotives working in the Exeter district the following have been noted: Nos. 704, 705, 707, 709, 714, 715, 724, 726, 729 and 733; also S.E. & C. section "Moguls" Nos. 829A and 831A to 844A. Several engines of this class working to Plymouth are painted in the passenger-engine green.

The new name-plates fitted to the "King Arthur" class engines of the L.S.W. section bear the words "King Arthur class" in small letters beneath the name of the engine. Those attached to No. 755, *The Red Knight*, have red for the background. No. 472E, originally intended for B section, is working from Bournemouth West. This engine, with No. 465, have modified domes and cabs. It would appear that No. 0422, an old 4-4-2T, is the sole survivor of her class working in the London area. No. 141E "F" class, Drummond small-boilered, mixed traffic 4-4-0, is rebuilt with an extended smokebox and Urie stovepipe chimney. This is the first of the class to be so treated and, together with Nos. 175E and 413E, is running with an eight-wheeled tender.—[M. BOTTEN, S. C. CROWTHER-SMITH, K. H. MASSEY, R. N. MICKLEWOOD, and A. W. SMITH.]

There are now no I.W. Railway locomotives remaining in the red livery. Locomotive No. 6, I.W. Central Railway, is still black and running on the Ryde and Ventnor line. I.W.C. No. 7, also black, is at work on its own section, otherwise the I.W.C. trains are generally hauled by the named locomotives of the I. of W. Railway.—[C. G. WOODNUTT.]



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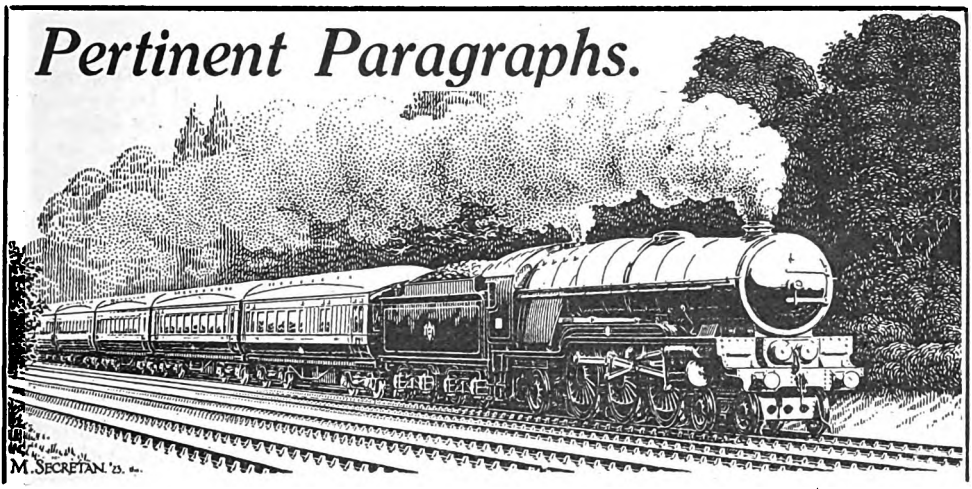
Pertinent Paragraphs.



Reconstructed 2-6-0 Locomotive, Great Southern Railways, Ireland.

It will be remembered that some time ago the late Midland Great Western Railway of Ireland purchased several of the 2-6-0 locomotives constructed at Woolwich Arsenal after the war to the general designs of Mr. R. E. L. Maunsell, C.B.E., now Chief Mechanical Engineer of the Southern Railway. Obviously the engines could not be used in Ireland as originally constructed, so that a degree of rebuilding has been necessary to adapt them for running there. We are indebted to Mr. W. H. Morton, Deputy Chief Mechanical Engineer, Great Southern Railways, Ireland, for the photograph reproduced as frontispiece, and for particulars of the engines as placed in service. The leading dimensions are as follows :—

Cylinders	19 in. by 28 in.
Coupled wheels, diam.	5 ft. 6 in.
Working pressure	200 lb. per sq. in.
Heating surface—	
Firebox	135 sq. ft.
Large tubes (21—5⅛ in. diam.)	357 sq. ft.
Small tubes (175—1¾ in. diam.)	1,034 sq. ft.
Superheater tubes (21) ..	285 sq. ft.
Total heating surface ..	1,811 sq. ft.
Grate area	25 sq. ft.
Wheelbase, coupled	15 ft. 6 in.
Wheelbase, total	24 ft. 4 in.
Weight on coupled wheels ..	47 tons 18 cwt.
Total weight of engine in working order	61 tons.
Total wheelbase, engine and tender	47 ft. 9¼ in.
Total length over buffers ..	57 ft. 6⅝ in.
Weight of engine and tender in working order	100 tons.
Tractive effort at 85 per cent. boiler pressure	26,000 lb.

The tender is on six wheels, 4 ft. diameter, with a wheelbase of 13 ft., and has a water capacity of 3,500 gallons and a coal capacity of 5 tons. The weight loaded is 39 tons 5 cwt. The engine is fitted with steam brake apparatus for controlling the vacuum brake, while the tender has vacuum and hand brake apparatus. These engines are generally being employed on the Midland Great Western section, and although the engine illustrated was at first numbered 410, as shown, it now carries the number 372.

"The Train which took the Wrong Turning."

It is not surprising that the recent incident when a Southern Railway train from Cannon Street to Tonbridge via Chislehurst was sent via Redhill, reaching its destination station after a lengthy detour of some 60 miles, provided a text for much pseudo-humorous comment in the general press, as well as caustic remarks by the uninitiated. Even to those who know the locality and the traffic, the occurrence is not easy to understand, though apparently the course adopted officially was actually the best under the circumstances.

That a train should be incorrectly described ahead by a signalman is an unusual occurrence, but having in view the complexity of the section of line concerned, and the variety of trains involved, it might easily happen. The real truth, apparently, was that the driver accepted a clear signal for an incorrect route, instead of stopping and whistling or otherwise asking for the right signal. Having passed the junction, however, to return the train would have involved complicated procedure, especially if our understanding is correct that the line is controlled by lock-and-block signalling, and would probably call for use of the release key as well as the making out of a wrong-line order, and carrying out other procedure. As the incident happened

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at the beginning of the evening rush period, it was apparently a very sensible solution to send the train on as was done. Unfortunately, however, once on the Croydon and Redhill route, there was no way of getting back to the proper route. Had that been practicable little or nothing would have been heard of the occurrence. As it was, however, the train was given a long detour via Redhill and round to Tonbridge, reversing there so as to serve Orpington and Chislehurst.

Much was, of course, made of the inconvenience to passengers who arrived home an hour or more late. Probably the majority appreciated the humorous and interesting side of the matter, while their unique experience no doubt provided a topic for conversation for many days afterwards. A few people may have been seriously incommoded. The great point was, however, that all the other passengers in later trains were saved the delay which would have been entailed in returning the train to its correct route, and carrying out the elaborate "safety" procedure which it would have involved.

L.M.S. Time-Table Development.

NECESSARILY, the public time-tables issued by the leading railway companies are bulky volumes, and although the Summary Tables which are usually included simplify the problem of ascertaining the principal services between London and various stations, also between provincial centres, it is not an easy matter to provide for easy reference so as to cover also connections, &c., without undue complexity.

In order to overcome this difficulty, the London Midland and Scottish Railway is introducing a "Principal Services" pamphlet, as an adjunct to the standard public time-book (to be sold independently thereof, price 1d., as well as included therewith). The main characteristic is that, while the centre of the page (printed in red) includes columns setting forth the principal services in outline, with times at the chief stations, at each side are small tables (in black), showing connections at various stations. These tables are directed to the connecting or interchange points by arrows, each service also including reference to the number of the column appertaining to the main train with which connection is made.

The arrangement is essentially simple, as are all good practicable ideas, and is applied so as to replace the Summary Tables hitherto given. Incidentally, much further information is actually presented without complication, as would be the case were an attempt made to combine the same supplementary particulars with the ordinary Summary Tables. The new pamphlet includes some 35–40 pages prepared in the style indicated.

It will, of course, still be necessary to consult the general tables for fuller details, and for secondary services, but the whole idea is distinctly good, and its realisation singularly lucid. As an adjunct to the ordinary time-book this presentment of the Summary Table section, available also independently of the complete time-book, at a nominal price, will no doubt be welcomed by the travelling public.

Engineman or Engineer?

ALMOST from the beginning of railways, the title of "engine driver," or "driver" when the particular application is understood, has been used to describe the man in charge of a locomotive engine, although practice has varied, as regards his colleague, between "stoker" and the more modern term "fireman." In the United States, however, practice has for many years caused the driver to be known as the "engineer." It will readily be admitted that the capabilities called for from the men in charge of modern locomotives may entitle them to be regarded as qualified "engineers." At the same time, the term engineer is usually understood to apply to those actively engaged in the profession of engineering, as distinct from those having manual skill in performing engineering work. It is of interest, therefore, to find that, as pointed out by our American contemporary, the *Railway Review*, the United States Civil Service Commission has adopted the use of the term "engineman" in lieu of "engineer" in advertising examinations for positions involving the operation, maintenance and repair of stationary or moving engines, but not requiring a professional education. It is, of course, general in this country to speak of an engine crew collectively as "enginemen," but it is certainly a move in the right direction that our friends across the Atlantic should be contemplating the replacement of the term "engineer" by an alternative which is less liable to confusion with professional engineering.

A Tube Railway Collision.

ON January 19, at about 8.40 a.m., on the loop between Strand and Charing Cross stations on the Hampstead section of the London Electric Railway, a five-car train which was standing at the first automatic signal beyond Strand station was run into from behind by a seven-car train. As a result of the accident the motorman of the colliding train had his leg badly crushed and broken, the guard of the standing train was injured, and two gatemen and one passenger received bruises or slight injuries.

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The colliding vehicles were damaged more or less, but there was no derailment or damage to the permanent way.

As usual, various complicating factors provided the circumstances leading up to this accident. The trouble began with a previous train, causing two trains to be held up in the loop line tunnel while steps were being taken at Strand station to reverse trains there instead of running them round the loop. The colliding train, No. 59, being of seven cars, was not clear of the track joint between G and H tracks as it stood at the platform at Strand, and, since the lever operating the crossover road was electrically locked, it was necessary for the train to be drawn forward past the starting signal before the crossover road could be set. Passengers were detrained and the driver drew his train forward as instructed. In doing so, however, he went past the starting signal at which the train was tripped, the train stop being in the operative position. The trip cock was then closed and the train prepared for the reverse movement. The crossover was set, but the north-bound starting signal at the west end of the south-bound platform was not lowered. A message then came from Charing Cross that No. 5 train, the original cause of the trouble, was on the move again, and the signalman decided to allow No. 59 train to take its normal route round the loop and pulled off the usual running signal levers, including the south-bound starting signal, so as to restore the frame to its normal running condition. The driver was also told that the train was to continue round the loop, but in terms that suggested that he had a clear road whereas actually the starting signal, which he had already passed under instructions, was held by No. 2 train, the second of the trains waiting on the loop.

The signalman then went to the north-bound platform to see what was happening to No. 5 train, and on his return found that No. 59 had left. Consequently No. 59 came into collision with No. 2.

Although the situation was complicated by the failure of train No. 5 and the change in methods decided upon by the responsible staff, the accident itself was due to incorrect assumption on the part of the station and train staff at Strand station that the section of line ahead of the starting signal was clear, and as No. 59 had passed the signal and released the trip cock as explained for the moment the usual protective methods did not apply.

Need for Unmistakable Instructions.

THE accident showed a possible weakness due to conditions which had not hitherto occurred. The instruction given was, of course, intended only to convey an intimation that, after at first deciding to reverse the train at Strand, further information came to hand appearing to justify a change back to normal methods, and the accident was entirely due to accepting an instruction as to change of route as entitling the motorman to proceed independently of signals. It is admitted that the circumstances were quite exceptional, in that the signal had already been passed under authority, and the assumption that it was being held at danger by train No. 59 and not by train No. 2 was a natural one, though actually it was incorrect.

Principal blame is attributed to the station foreman, who at the time was acting as stationmaster, though Major Hall's report suggests that several other persons concerned were not altogether free from blame. The motorman of the colliding train is not blamed in any degree, as he was not in a position to see the signal when he received authority to start, and appeared to have been on the alert and to have taken prompt action, though he had very short warning owing to the sharpness of the curve, so that he was almost on top of the standing train before it came into his view.

A Clean Sheet for the Signalling.

AN important feature is that there was no failure of the apparatus, and had it not been for a combination of factors, no accident would have occurred. As it was, the failure of No. 5 train rendered it necessary to consider methods of getting traffic moving independently of it, while the train which was concerned in the change of instructions happened to be one of the few seven-car trains running, these being the only ones which would require any special movement owing to their length exceeding the distance between G–H track joint and the train stop. In normal working such trains would never be required to use the crossover, and had it not been that one of the few seven-car trains was concerned, everything would have been adequately safeguarded and no question of incorrect or ambiguous instructions would have arisen. Delay in getting passengers out of No 2 train was due to the fact that the damage at the colliding ends was greater than would permit of this being done, and alternative methods had to be adopted in view of the fact that to avoid too serious congestion, trains had to be kept running as far as Strand station. The inspecting officer's recommendations relate primarily to moving the starting signal to allow the longest trains running to be able to stand between the track joint and the trip lever.

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A Notable Signalling Replacement.

A FEW weeks ago a very interesting piece of signalling work was carried out at Ealing Common station on the Metropolitan District Railway. Just to the west of that station is the Uxbridge branch junction, worked from Hanger Lane Junction signal-box. The junction points are sufficiently near to Ealing Common station box to permit of their being worked therefrom by power, but not mechanically. In order, therefore, that the Hanger Lane box could be dispensed with, it was decided to replace the mechanical locking-frame in the station box by a power frame and to work the junction and all the signals by electro-pneumatic signalling, together with the numerous points and signals on the east side that give access to and from the car sheds. Arrangements were made for the work to be carried out continuously by means of relief gangs in which each man had his allotted task. The work was commenced just after the midnight of a Thursday-Friday, and by 3 a.m. the old locking-frame had been removed, which allowed for the floor to be taken up. At 4.30 the new floor was commenced, and when that was finished, by 7 a.m., the new electro-pneumatic locking-frame was commenced. That was erected by 4.30 p.m., and then the interlocking, point and signal-control wires, &c., were put in hand, and all this was finished by 10.43 a.m. on the Saturday, or 34 hours after the work was commenced.

The points and signals on the east side of the box could not be coupled up until the night of Monday-Tuesday, as advantage was taken of the alterations to renew and greatly improve the lay-out of the car shed connections. The main portion of that work could only be done when no trains were running, but at 5.20 on Tuesday morning, when the train service for the day was commenced, the whole of the changes had been completed and all was working normally.

A feature of the work was that the running signals worked automatically during the time the box was out of commission, through running tracks being temporarily laid in, and so the trains protected themselves. The illuminated diagram was early brought into use and that enabled the signalmen to see where the trains were. The whole work reflects great credit on the operating, permanent way and signal departments of the District Railway.

INTERIOR OF OLD MANUAL CABIN AT EALING COMMON.

"Pyropruf" Roofing Demonstration.

IN the presence of a large company of fire experts, representatives of Government departments, municipal authorities and others, Messrs. D. Anderson & Son Ltd., of Belfast, arranged a practical demonstration of their

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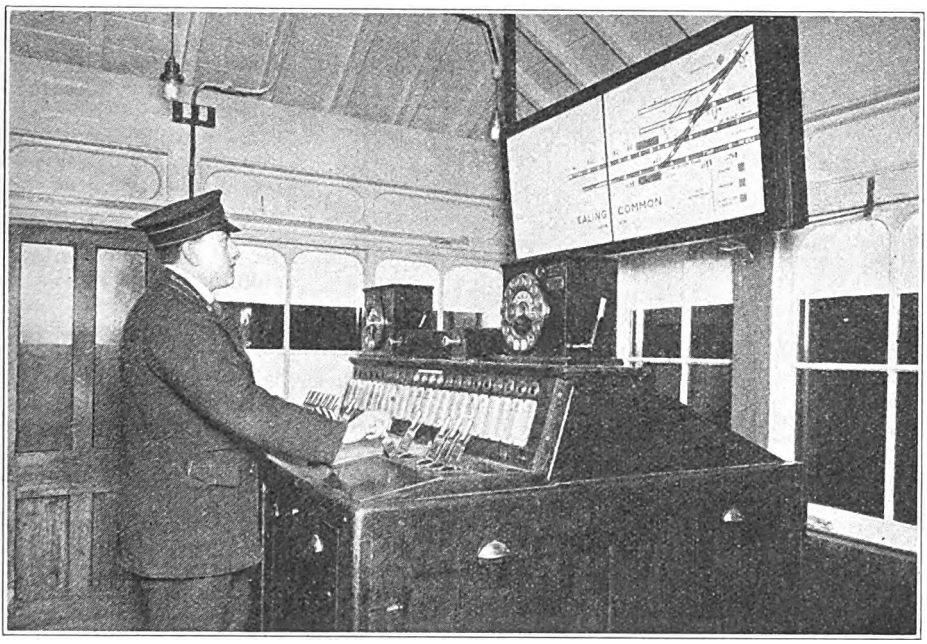
new flexible asphalte roofing material, "Pyropruf," on Thursday, April 23. On a site near Victoria station, three brick buildings, roofed respectively with slates, tiles and the new roofing, and filled with highly combustible material, were set on fire and subjected to a heat of some 3,000° Fahr. The slate and tile-roofed sections on either side of, and divided from, the Pyropruf-covered structure by thin brick partitions, were set alight first, and after 10 minutes the roofs caught fire and fell in. The centre building, having been subjected to intense heat for 20 minutes, was then set on fire, and burned fiercely, the flames coming through the skylight without affecting the roof, until the stabilised bitumen in the compound had been completely carbonised, after about 30 minutes, when it slowly burned, but there was no heavy mass to drop into the building. At the luncheon which followed at the Hotel Cecil, Mr. W. L. Lutyens, the managing director, explained the advantages of "Pyropruf," and claimed that it was dustproof, windproof, airtight and waterproof, and that it was lasting and economical, being only half the cost of tiles and slates. In view of building costs, he hoped it would find favour with Government and municipal authorities. His company were prepared to give, and lay free of charge, 1,000 rolls of Pyropruf, anywhere in England.



INTERIOR OF NEW POWER CABIN AT EALING COMMON.

A Record Run in Ireland.

ENQUIRIES have been received from various readers as to a record run made between Belfast and Dublin on the Great Northern Railway of Ireland on July 22 last. Seeing, however, that the load consisted merely of one vehicle—an ordinary tri-composite-brake weighing 33 tons—the run is interesting only because of the high speeds maintained. From this point of view the run is worthy of brief reference, and we are indebted to Mr. John Bagwell, General Manager of the Great Northern Railway of Ireland, for a detailed schedule.

The engine was 4-4-0 No. 190, driven by R. Bruce. Leaving Belfast at 2.22 p.m., a stop for half a minute was made at Lisburn, to which point, however, the 7·550 miles had been taken in 7½ mins., average 60·40 m.p.h. Thence to Portadown, 17·388 miles were run in 16 mins., average 65·21 m.p.h. The next 15·812 miles to pass Goraghwood occupied 14¼ mins., average 66·58 m.p.h., and to Dundalk, 17·563 miles, 14¼ mins. were taken, average 73·95 m.p.h. The 22·600 miles thence to Drogheda were run in 18½ mins., average 73·30 m.p.h., and after running 30·012 miles to passing Clontarf in 24 mins., average 77·28 m.p.h., the 31·687 miles from Drogheda into Amiens Street, Dublin, were completed in 26 mins., average 73·12 m.p.h. The average speed for the

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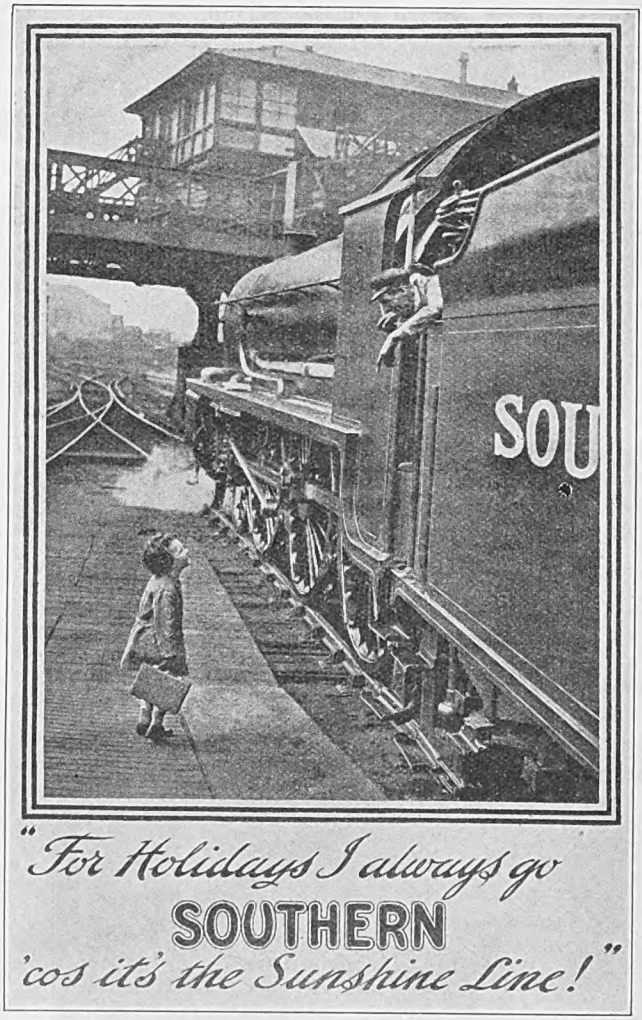

SOUTHERN RAILWAY PHOTOGRAVURE POSTER.

whole run of 112,600 miles from Belfast to Dublin, including the half-minute stop at Lisburn, was, therefore, 69·65 m.p.h.

Southern Railway Photogravure Poster.

A POSTER has been issued by the Southern Railway reproduced from an actual snapshot taken from the end of one of the platforms at Waterloo Station. As shown by the small scale reproduction above, it depicts a small boy of five, "very businesslike with his spectacles and attaché case, smilingly wishing 'good luck' to the driver" of a locomotive which is taking a West of England express. It is explained that the snapshot was sent in to the Publicity Department at Waterloo, and the Southern Railway, "recognising that in its way the photograph had a holiday appeal which no artist could depict," arranged with Waterlow & Sons to enlarge the snapshot to 16-sheet size and make a photogravure print. In this form the poster is believed to be the biggest and the first photogravure poster of its kind ever to be prepared in this country. The whole operation was, moreover, carried out by Messrs. Waterlow in one printing. A special point is that the poster is an exact reproduction of the original photograph, and has a lifelike reality which it is claimed no railway poster yet issued has ever achieved. The caption underneath the photograph explains that the boy is telling the driver why he takes his holidays on the "Sunshine Line." Five hundred of the 16-sheet posters have been printed and 3,000 in the smaller double royal size. Messrs. Waterlow are exhibiting specimens at their stand at Wembley.

When the original particulars of this poster were issued, the Southern Railway offered to present a framed copy of the smaller-sized poster, suitably inscribed, with a framed photograph of a "King Arthur" class locomotive, to the boy shown, whose identity was then unknown. As a sequel, we understand that quite a number of parents brought their children to the offices at Waterloo, but as the photograph was actually taken last year, whereas they all claimed that the incident shown occurred recently, they had to be sent away disappointed, although most of the children were given a consolation presentation of a locomotive photograph. Thanks to the good offices of a friend, however, the company state that the little boy has been found and his identity established by other photographs. His name is Wilfrid Witt, and he is now resident in California, his father, formerly employed in the Electrical Department at Waterloo, having gone to the United States a few months ago. The Southern Railway Company have, therefore, written out to California and are fulfilling their promise by post.

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WHAT THE RAILWAYS ARE DOING.

THE directors of the London Midland and Scottish Railway announce that, in view of the experience of amalgamation, they have been considering the organisation of the executive control of the company, and that they have decided to create the post of President of the Executive. Sir Josiah Stamp, G.B.E., has accepted their invitation to take this position, and the Board of Nobel Industries Limited have agreed to free him from his administrative duties at the end of 1925. Sir Josiah Stamp will remain on the Board of Nobel Industries. The Board of the London Midland and Scottish Railway further state that Mr. Burgess has consented to retain his present position of General Manager.

* * *

THE directors of the Southern Railway Company have appointed Mr. Gilbert Szlumper as Assistant General Manager. For the time being he will retain his position as Dock and Marine Manager. Mr. G. R. Newcombe, Assistant Docks Manager at Southampton, has been appointed Deputy Dock and Marine Manager.

MR. G. R. NEWCOMBE,

Deputy Docks and Marine Manager, Southern Railway.

* * *

MR. GEORGE RYMER NEWCOMBE, who has been appointed Deputy Docks and Marine Manager, Southern Railway, became Assistant Docks Manager, Docks and Marine Department, Southern Railway, at the beginning of 1924. Mr. Newcombe is a son of the late Mr. Percy Newcombe, who was for many years connected with the Midland Railway Company, and grandson of Mr. William Lister Newcombe, a former Goods Manager and General Manager of the Midland Railway. Mr. G. R. Newcombe entered railway service as a junior clerk in the Goods Department at Burton-on-Trent. He later went to Sheffield (Wicker), and in 1902 joined the staff of the Engineer's Office of the old Lancashire, Derbyshire and East Coast Railway under the late Sir James B. Ball. When that line was taken over by the Great Central Railway on January 1, 1907, and Mr. Russell Willmott was appointed District Engineer, Mr. Newcombe remained as one of his assistants until September, 1908, when Mr. Willmott was appointed Manager and Engineer of the Stratford-upon-Avon and Midland Junction Railway, and Mr. Newcombe Assistant Manager. On January 1, 1912, when Mr. Willmott was appointed General Manager and Secretary of the Isle of Wight Central Railway, Mr. Newcombe accompanied him as Assistant General Manager. This position he held until July, 1920, when he was appointed Manager of the Isle of Wight Central Railway on the death of Mr. Russell Willmott. He continued to hold this post until the company was absorbed by the Southern Railway on January 1, 1923, and during that year was acting District Superintendent in the Isle of Wight.

* * *

WE are officially informed that the directors of the London and North Eastern Railway Company appointed Mr. J. A. Wickham to be Assistant General Manager (Parliamentary), with charge under the Chief

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General Manager of parliamentary, works and rates matters. In addition, Mr. Wickham will act as the company's Industrial Agent.

We are also advised that Mr. E. A. Clear, formerly Assistant General Manager to the Great Central Railway and since 1923 Assistant Divisional General Manager of the Southern Area of the London and North Eastern Railway, will retire from the service on June 30 next.

Mr. Clear will be succeeded as Assistant Divisional General Manager for the Southern Area by Mr. A. Oldham, at present Assistant to the Chief General Manager.

The directors have also appointed Mr. G. C. Ring, Assistant Registrar, to be Registrar of the company, in succession to the late Mr. J. A. Campbell. Mr. Ring will be subject to the control of the Secretary, Mr. J. McLaren, but will have his office at Hamilton Buildings, London, E.C.

* * *

We are officially informed, under date of April 8, that the organisation of the Chief Goods Manager's Department of the London Midland and Scottish Railway is now as follows :—

	HEADQUARTERS.		*Previous Position.*
Chief Goods Manager	S. H. Hunt	Euston	Same.
Indoor Assistant	H. J. Guest	,,	,,
Staff Assistant	F. Findley	,,	Deputy Staff Assistant to General Superintendent.
Goods Operating Manager	W. A. Ree	,,	Same.
Station Operating Asst.	E. Falconer	,,	Asst. to Gen. Supt.
Road Transport Asst.	E. H. Davies	,,	,,
Horse Superintendent	H. Quiggin	Manchester	Same.
Road Motor Engineer	J. Shearman	Euston	,,
Goods Commercial Manager	J. Pike	,,	,,
Commercial Assistant	A. W. Barrett	,,	Head of Rates Office.
Indoor Assistant	A. E. Blount	,,	Indoor Asst. to Divisional Goods Manager.
Rates and Charges Asst.	H. B. Webster	,,	Chief Clerk of Rates Office.
Outdoor Assistants to Chief Goods Manager	J. V. Partington	,,	D.G.M., Rugby.
	F. B. Thornhill	,,	Assistant D.G.M., Rugby.
Goods Manager (Scotland)	J. Ballantyne	Glasgow	Same.
	DISTRICT OFFICERS.		
District Goods Managers	J. B. Parkhouse	London	Same.
	E. H. Hackwood	Northampton	District Goods Manager, London (Mid.) Commercial.
	G. J. Huson	Leicester	Same.
	E. Crofts	Bristol	Agent.
	W. A. Thomas	Wolverhampton	Same.
	T. H. Shipley	Birmingham	,,
	H. W. Phillipps	Chester	District Goods Manager, Manchester (L. and Y.).
	W. Bingham	Stoke	District Goods Manager, Warrington.
	G. G. Mallory	Sheffield	Asst. to Gen. Supt.
	A. L. Castleman	Warrington	,,
	F. R. Hauxwell	Bolton	Same.
	F. K. Rogers	Barrow	District Traffic Supt., Lancaster.
	T. E. Argile	Leeds	Asst. to Gen. Supt.
	H. Manock	Liverpool	Same.
	F. P. Kinsman	Manchester	,,
District Traffic Superintendents	C. H. Tait	Abergavenny	,,
	A. Walker	Swansea	,,

We regret to record the death, on April 19, at a nursing home, in his 74th year, of Sir David Lionel Goldsmid-Stern-Salomons, of Broomhill, Tunbridge Wells. Sir David Salomons was a Director of the Southern Railway Company, and had long been connected with railways, as he joined the South Eastern Railway Board in 1895, and from 1908 to 1922 represented that company on the South Eastern and Chatham Railway Companies' Managing Committee. Taking honours in Natural Science at Caius College, Cambridge, he contributed from time to time many pamphlets and papers on electrical and other subjects, and was one of the pioneers of motor traction in England. He was a past Vice-President and Treasurer of the Institution of Electrical Engineers and also a Director of the City of London Electric Lighting Co. Ltd.

* * *

Sir Davison Dalziel, M.P., has been elected President of the Board of Directors of the International Sleeping Car Co. Ltd.

* * *

Mr. A. G. Douglas has been appointed to the position of Assistant Chief Mechanical

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Engineer, New South Wales Government Railways. This follows the elevation of Mr. A. D. J. Forster, formerly Assistant Chief Mechanical Engineer, to the position of Assistant Commissioner for Railways in the recent reorganisation of the Board.

* * *

MR. A. A. BIGGS, Chief Engineer, Madras and Southern Mahratta Railway, has been appointed Agent of the railway on the retirement of Sir Charles Magniac.

* * *

COLONEL W. H. WYNDHAM-QUIN, of 5, Seymour Street, Portman Square, W., has been appointed a Director of the Great Western Railway Company to fill the vacancy caused by the death of Lord Barrymore.

* * *

IN view of the amalgamation of Irish railways, the following officials of the Cork railway companies have resigned :—

Cork, Bandon and South Coast Railway : Mr. R. H. Leslie, Secretary ; and Mr. James M. Johnstone, Locomotive Engineer.

Cork and Macroom ; Messrs. J. J. Barry, Manager and Secretary ; W. Gadd, Locomotive Engineer ; and R. Evans.

Cork, Blackrock and Passage : Messrs. R. J. Coppinger, Secretary ; R. H. Good, Manager and Engineer ; James Inman, Marine Engineer.

Mr. T. O'Connor, General Manager of the Muskerry Railway, is expected to retire in due course.

* * *

THE new *Glen Sannox*, successor to one of the most famous of Clyde steamers, is nearing completion. Specially built for the L.M.S. fleet, the new *Glen Sannox* is in many respects similar to the *Duchess of Argyll*, one of the most graceful craft on the Clyde. Her speed will be 23½ knots. She is 250 ft. long by 30 ft. broad by 10 ft. 6 in. to main deck. Three Parsons' independent steam turbines will be fitted, each driving a separate shaft with propeller. The L.M.S. will employ the new ship on the Ardrossan-Arran line.

* * *

THE *St. Julien*, one of the new passenger steamers which the Great Western Railway is placing on the Weymouth–Channel Islands service, arrived at Weymouth from Glasgow recently. Among those who made the journey were Lord Churchill (Chairman) and other directors of the company, Sir Thomas Bell, and Sir William Ellis. A new steamer, the *Roebuck*, for the Weymouth–Channel Islands cargo service, built by Swan, Hunter & Wigham Richardson Ltd., has also been handed over to the Great Western Railway.

* * *

BELL signals for starting trains have been installed at "Underground" stations between Sloane Square and Mansion House, and the scheme is being extended to stations eastward of Mansion House as far as Aldgate East. These enable trains to be got away more promptly than was the case when whistles were employed. Owing to the length of the trains the whistles often had to be repeated.

* * *

PURLEY OAKS station, which has been closed on Sundays since the early days of the war, has been reopened on Sundays as a result of the introduction of the electric trains on this section of the Southern Railway.

* * *

BY the end of the year new escalators will be operating at the following "Underground" stations :—Old Street, 2 ; Oval, 2 ; Clapham Road, 2 ; Oxford Circus (C.L.R.), 2 ; Tottenham Court Road, 5 ; Bond Street, 2 ; Liverpool Street, 1 additional escalator. All these escalators will be of the Cleatcomb pattern, with the exception of Tottenham Court Road, at which station there will be one only.

* * *

ON and from Monday, May 4, numerous alterations were made in the undermentioned passenger train services : Euston, Broad Street, Willesden, Watford, St. Albans, Croxley Green and Rickmansworth ; Broad Street, Willesden, Kensington, Earl's Court, Kew Bridge and Richmond ; Broad Street and suburban stations on the L. and N.E. line ; Broad Street, Dalston, Bow and Poplar. A new pocket time-table containing full particulars of these services has been issued.

* * *

COMMENCING May 18, through carriages were again run to Ramsgate Harbour from Manchester (London Road) and from Birmingham (New Street). The through service from Liverpool to the S.E. continues to run. Other notable improvements will be introduced when the summer time-tables come into operation. The L.M.S. hope to run through corridor services from Leeds to Eastbourne and from Nottingham to Ramsgate.

*

THE whole of the alterations and improvements to the Bank station, C.L.R., are now completed. Work commenced over two

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years ago, and included the driving of an escalator tunnel 27 ft. in diameter, at an angle of 60 deg. under the roadway, without causing inconvenience to the 30,000 passengers who used the station daily. Of the five electric lifts, three had to be taken gradually out of service until only two remained. These latter were speeded up and double-manned and supplementary staff employed. The passimeters and rapid ticket-issuing equipment have been installed. Traffic is now at the rate of 10,000,000 passengers per annum.

* * *

SEVERAL readers have written in regard to the rebuilt locomotives, particularly of the "King Arthur" class, some mentioning, indeed, that they have seen in works sidings old engines bearing the same numbers as those borne by other locomotives in service which purport to be rebuilds of the former. We understand that most, if not all, of the new engines are actually replacements, which explains why, at the same time, new locomotives bearing the same numbers are in service. To all intents and purposes, therefore, the "King Arthur" class are new engines built as a modification of the "Urie" 4-6-0 class, and not rebuilds in the sense that that term implies, the rebuilding and possible modification of an existing class.

* * *

MR. J. H. DONOHUE mentions a recent journey on the 1.50 p.m. non-stop train from Waterloo to Portsmouth Town. The engine was No. 338, an early "Drummond" 6-ft. 6-in. engine, and although pulled up at Liphook for signals for nearly two minutes, Portsmouth (Town) station was reached at 3.34 p.m., a most creditable performance with a load of 11 bogie coaches. The return journey was made behind a 4-6-0 No. 446 with, however, seven bogies only. Starting four minutes late, Waterloo was reached two minutes early, some very high speeds being made here and there.

* * *

WE have received from Mr. A. Ranson Cowlishaw, of 11, Canford Road, Clapham Common, S.W.11, a sample of "Grisco" grease, which is claimed to be a high-class labour-saving, superfine, machine lubricant. It is made solely by Grisco Limited, of Paddington, London, W. Exceptional properties are claimed for this new grease lubricant, the most noticeable being its efficiency over long periods, thus ensuring added life for the bearings, gears, &c., to which it is applied. Although the first cost is somewhat higher than that of other high-class greases, an ultimate economy is promised owing to the longer life of the lubricant in use. Its acid content is negligible and moisture only 4 per cent. The lubricant is prepared by an entirely new scientific process, and is guaranteed to withstand wide ranges of heat and cold. It is made for use in all kinds of machinery and shafting that require grease for lubricating purposes.

* * *

THE Wimbledon and District Model Railway Clubs have arranged the following events for June. 8th—Lecture, "French Railways," by Mr. J. Cook. 15th—Test Track night. Both at 7.30 p.m., Red Cross Hall, Church Road. 27th—An unusual, but very interesting visit to the Sanitary Laundry Ltd., Kingston. (Meet Kingston Station, S.R., 2.45 p.m.)

The visit to Messrs. Stuart-Turner's Works on April 25 was much appreciated. The Hon. Secretary has received many inquiries as to membership, &c., as a result of these notes in THE RAILWAY MAGAZINE, and is always pleased to supply full particulars of the Club. Address: 27, Bernard Gardens, Wimbledon.

* * *

SOUTHERN RAILWAY 4-6-0 locomotive, No. 767, at first intended to be named *Sir Mordred*, as explained in the May RAILWAY MAGAZINE, is to be named instead *Sir Valence*. The name of No. 771 is *Sir Sagramore*.

* * *

MR. D. B. HART points out that the illustration shown on page 292 of the April number is incorrectly described, as G.W.R. 4-6-0 locomotive No. 4073 is named *Caerphilly Castle*, while *Pendennis Castle* is No. 4079.

* * *

AMONG the named locomotives now in service on the Southern Railway may be mentioned the following: Rebuilt Drummond engines—No. 453, *King Arthur*; No. 454, *Queen Guinevere*; No. 455, *Sir Launcelot*; No. 456, *Sir Galahad*; No. 457, *Sir Bedivere*. Urie 4-6-0 locomotives—No. 736, *Excalibur*; No. 748, *Vivien*; No. 755, *The Red Knight*.

* * *

SEVERAL readers point out that long main line trains leaving Euston are now frequently banked by the engine which has brought in the empties to the summit of the Camden incline.

* * *

EXPRESS trains between Toronto and Winnipeg, by Canadian National Railway in 37 hours westbound and 36 hours 50 min. eastbound, and by C.P.R. in 36 hours 15 min.

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westbound and 36 hours 35 min. eastbound, have been given timings of 38 hours westbound and 4 min. less eastbound, in each case.

* * *

THE Canadian Pacific Railway has just issued an attractive illustrated booklet devoted to holiday tours in Canada. The tours have been carefully compiled to include just that amount of travel, leisure, sightseeing, and novelty that goes to make an ideal holiday, and can be modified or extended to suit each individual traveller's wishes. The booklet may be obtained on application to the Canadian Pacific Railway, 62–65, Charing Cross, London, S.W. 1.

* * *

WITH the opening of the new G.W.R. branch line between Dunstall Park and Brettell Lane for passenger, parcels and goods traffic the public are afforded an additional service of trains between Wolverhampton (Low Level) and Stourbridge Junction. Intermediate stations or halts have been provided at Tottenhall, Compton, Penn, Wombourn, Himley, Gornall, Pensnett, Bromley and Brockmoor. The line, which provides seven through services daily, in each direction, between Wolverhampton and Stourbridge Junction, is worked by rail motor-car, one class only. In addition, there is one return trip between Wolverhampton and Brettell Lane and Wolverhampton and Wombourn.

* * *

TEN L.N.E.R. "Pacific" engines are to be named after notable racehorses, in view of the "speed" capabilities usually associated therewith. The following names will be used: *Flying Fox* (already running), *Ormonde, Hermit, Minoru, Ladas, Bend Or, Persimmon, Robert le Diable, Donovan* and *Doncaster.*

* * *

THE 1925 edition of the Southern Railway Official Guide, which has been published for many years under the title of "Hints for Holidays," is considerably amplified, partly in view of the fact that it now covers the whole of the Southern Railway system, and partly in view of various developments. Special attention may be directed to the series of sketch maps of various districts, designed to indicate principal features of interest, while maintaining the required standard of map accuracy. Among special features may be mentioned 11 pages of "Wisdom for the Holiday Angler," in the form of a chapter by Mr. E. Le Breton Martin, the well-known sea fishing expert. Three hundred illustrations and 11 district maps are included, and, in addition, there is a comprehensive and up-to-date list of hotels, boarding houses, apartments, &c. "Hints for Holidays" gives full details of over 250 golf courses served by the Southern Railway. Copies of this book, which is sold at the nominal price of 6d., together with numerous other booklets published by the railway company, including "The South Downs," "Rambles in Sussex," "Holiday Resorts in Normandy and Brittany," "The Golden Sands of Picardy," "The Peerless Riviera," and "Ostend and the Belgian Coast," are on sale at all Southern Railway bookstalls, and at the various inquiry offices at Waterloo, Victoria, Charing Cross, London Bridge, &c. A beautifully printed folder, "South for that Holiday Tan," is being distributed free throughout the areas served by the Southern Railway.

* * *

A FEATURE of interest in the Wembley Exhibition to railway men in addition to the ordinary railway exhibits in the Palace of Transport is a 9½-in. gauge miniature railway that has been installed round the Children's Paradise, Treasure Island. The track is about 800 ft. long, is of Vignole section rail riveted on to steel sleepers and includes a siding and two points. There are two locomotives, one 2-in. scale L.N.E.R. "Atlantic" type, and one front coupled tank locomotive. They are both finished in black and lettered in the standard Canadian Pacific Railway Company's practice. The rolling stock consists of one passenger train of ten bogie coaches, holding two passengers each, and a goods train consisting of bogie goods vehicles of the same capacity. The main station is a very accurate representation of the Canadian Pacific station of Banff in Canada, to a small scale.

* * *

MESSRS. BASSETT-LOWKE LTD. send a copy of their scale model catalogue, section S, dealing with ships and fittings, &c., therefor. This is the first time since the war that this particular list has been thoroughly revised, and mention may be made of the fact that considerable reductions in prices are shown. Attention is particularly directed to the marine models and sets of parts therefor; also to a series of waterline models. The list concludes with particulars of a series of models of Continental origin, for which Messrs. Bassett-Lowke Ltd. are agents. The catalogue is sold at the nominal price of 1s., and copies can be obtained from Northampton, the London office at 112, High Holborn, W.C.1, or from the Edinburgh branch, 1, Frederick Street.

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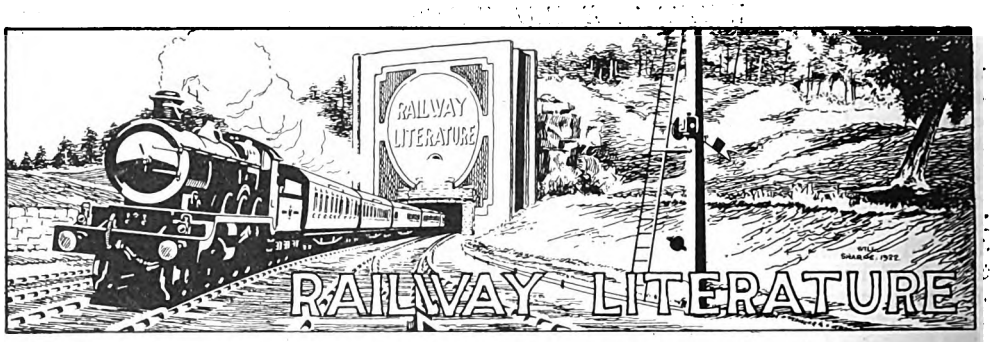

THE RAILWAY YEAR BOOK, 1925. [Railway Publishing Co. Ltd., 33, Tothill Street, Westminster, London, S.W.1. Price 5s. net; by post, 5s. 6d.]

Once again, a feature of *The Railway Year Book* is rearrangement and essential revision, with the addition of new material as necessitated by further developments in grouping. This time, however, these changes are associated with the Irish section, in that, under the Irish Railways Act of 1924, practically all railways in the Irish Free State, except for the Great Northern, are in course of amalgamation and absorption into the new Great Southern Railways.

In view of this essential change, an article is included dealing with the new system, setting forth the directorate of the Great Southern Railways Company and its chief officers, together with historical and other information, as in the case of the British grouped railways. To allow for the fact that the Great Southern Railway—the name Great Southern Railways has applied only since January 1 of this year—as first constituted did not include the Dublin and South Eastern Railway, statistical information is necessarily given on a special basis. Thus, individual statistics are shown for the first half of 1924 in respect of the Great Southern and Western, Midland Great Western, and Cork, Bandon and South Coast Railways; for the second half, in regard to the Great Southern Railway, incorporating the three systems mentioned; and for the whole year in the case of the Dublin and South Eastern Railway. An analysis of the Irish Free State Railways Act is given.

A further feature associated with the Irish section, which also includes detail adjustments and revisions, is a new and specially drawn map of the Great Southern Railways system. A separate map is also given with the article dealing with the Northern Counties Section (Northern Ireland lines) of the London Midland and Scottish Railway.

In the British section articles relating to the various railways have been extensively revised and in many cases amplified. Additional information is largely incorporated, and in the case of the London Midland and Scottish Railway the organisation and personnel are set forth on a much more complete basis than was practicable last year, besides including new appointments and official changes virtually up to date of publication. In most cases opportunity has been taken to set forth the capital of the respective companies in greater detail than heretofore.

All standard features have been retained, revised and brought up to date, and several new items included. New maps have been prepared for the articles dealing with the Southern, Somerset and Dorset Joint, Metropolitan and "Underground" systems.

Special attention must also be directed to the fact that, for the first time, in addition to the classified "Contents," a comprehensive "Index" is included. This change, in view of the extensive reference use made in the offices of railway companies, Government departments, trading and manufacturing firms and the general public, will, no doubt, be welcomed by readers and users of all classes.

In the foreign sections, railways in colonies, protectorates, &c., hitherto classified separately, have now been placed in sub-classes according to their geographical location.

The "Who's Who" section, which has proved of exceptional usefulness in many quarters, and one of the most valued features, has been entirely revised in view of the numerous official changes which have occurred during the past year, and a large number of new biographies have been added.

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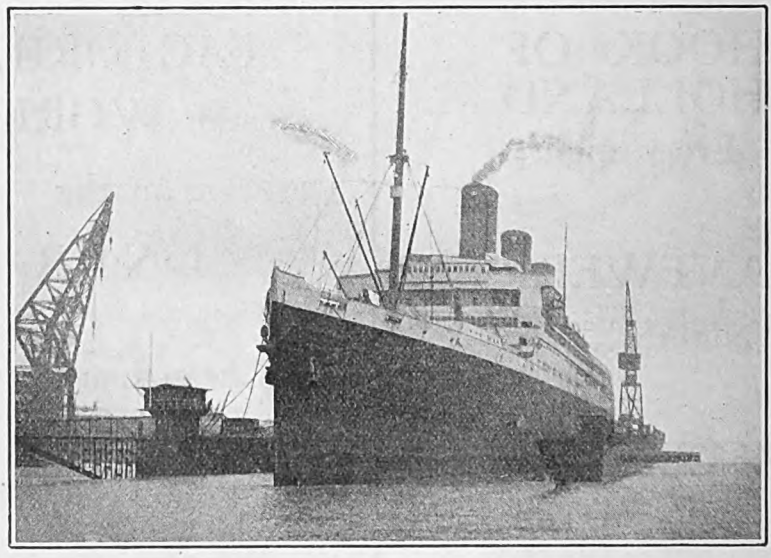

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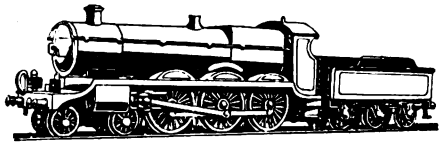

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(With which is incorporated "Transport and Travel Monthly.")

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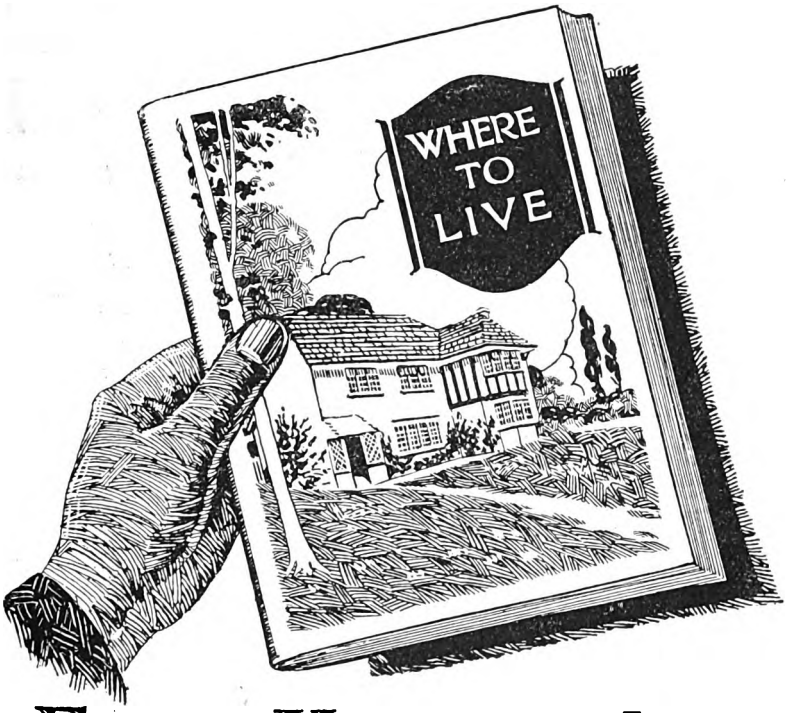

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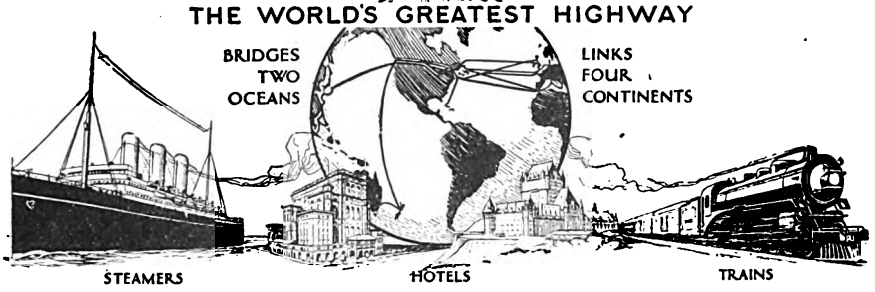

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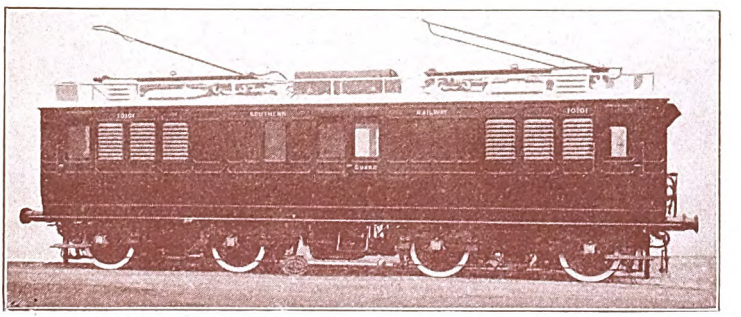

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